ECONOMICS OF TECHNOLOGY

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Preface - Summary

In this book we analyze the institutional arrangement between various actors to understand how ICT project objectives flow among actors in a standard LINCOS project and how they would affect the sustainability and effectiveness of LINCOS in particular and an ICT project in general. Since there are many actors involved in different stages and processes of a single LINCOS project, the paper analyses the bilateral and multilateral relationships among these actors to understand the factors that might affect the efficiency of the ICT project. In other words the paper looks at the actors involved in a LINCOS project in an effort to capture those circumstances under which a LINCOS project is exposed to principal- agent problems.

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1.
Economic theory of everything and its price dynamics

The defining premise of new economic tool

Growth Models of Schumpeterian strand of Economic thought (please see the original work: Schumpeter, 1906) have quite brilliantly defined Adam Smiths invisible hand as endogenous to the very processes that earlier assumed progress as exogenous to the economic (markets) , social (empowerment), political (Behavioral evolution), Legal (institutional correction of market failure) forces that shape contemporary global economic landscape. In short if economics can control for these forces as the endogenous growth models formulate, it can actually define and manufacture future of human progress at a universal scale.

It is like a theological cleche where God depended on humanity to realize himself on this planet. God is the theory of everything as the concept through centuries of abstract evolution of its invisible presence provided a blue print of the stream of knowledge evolved last many of these centuries of human progress. For example, the best science of artificial intelligence and its various network applications are still trying to encompass human imagination and bio mechanics if not restricting itself to the other natural exhibits on mother Earth and/or immediate and distant surrounding in deep space. So if humans are the best and most aesthetic mechanical exhibit of nature, the invisible hand of God is endogenous to his/her cognitive self actualization through humanity.

The self actualization of human cognition has given us today's science of technology that has journeyed from a life in a cave surrounded by life of basic necessacities few thousand years ago to International Space Station (ISS) orbiting the Earth today. And this

science is progressing of each passing day simplifying the complexity theorem from human rights to nature's sustenance yet making both's future endogenous to what our social, political, technical and economic progress achieves in these happening times of 21st century.

This brings me to the biggest constant in human Economic, Social, Technical and Political networking theories that have resulted to the progress of human race upto this point in time and that is time itself. So in an economic theory of everything the very missing variable in the intellectual debate in theory and its applied formulation is the variable time that has been thought to be of an independent value. Though in political science that explains economic, social, political and technical processes of the contemporary human society with the lense and lessons of past time (History) is a standard practice. But in the subject of economics, the founders of this social science wanted it to be a quantified method of investigation and thus formulated a framework of measures that could be captured on a pre defined yard sticks heavily relying on tools of investigation developed in mathematics and physics.

So basic economics defined/identified factors of production as land, labor and capital while quantifying them through its value/cost/price in mostly monetary terms. Technical progress, which is identified as the science of future was adjusted into capital formulation. So the basic tools of economics that are still valid foundations of the subject wanted to explain and quantify not only the present progress of human emancipation but also the future of it through quantifying the measurable monetary costs. Time is exogenous to economic progress or is considered to be the invisible phenomenon in economic measures only to be controlled in its qualitative application by manifesting in a subset of variations in social, political and economic experimentation. If economics wants to draw its parallels to the science of quantitative measures with perfect controls as is practiced in Mathematics and Physics, it needs to endogenise time into economic, social, political and technical modeling by introducing it as one of the value/cost/price of production/output/economic activity. An indirect application of the monetary value of time is available from Moores law that suggests less and less time is required for technical progress in hardware and software technology of computer science. Computer science has been the epitome of artificial intelligence and currently the bench mark of its evolution is biological and cognitive manifestation of human exhibit himself/herself. The network theory of human exhibits is the real interest of economics and thus technical progress of artificial intelligence and its trends in value

addition is quantified through time trends that follows a negative path. Thus endogenising technical progress as is the standard practice in endogenous growth models and giving a value to time as a cost to this stream of progress can make the basic production model to explain economics of everything.

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2.
Did early mathematics know about God: Harvard's Project 0

A non linear understanding of God

A Mathematical Paradox simply proves that God is '0' and 'infinity' or unknown till '1' can identify it to best of its qualitative observations par imagination: What can be a '0' and 'infinity' may also take the value '1', while that value '1' can only be fully realized when we either know '0' (the exact point of origin) or 'infinity' (the supposedly value of impossibility). Thus we cannot know God till we know it all and we can never know it all because the best science we know of is mathematics, which simply suggests that value of infinity can never be known. Thus we remain 3 dimensional space observations of ourselves and we are merely identifying God only through our own selves, while not capable of knowing what we just cannot know because of a 3 dimensional space limitations of our existence, though we can only imagine to recognize a set of such further but still limited possibilities to realize the authenticity of a simple law that God would remain as a singular identity of infinite possibilities. We at best try to understand some of relatively defined and logically perceived infinite possibilities of his existence by identifying some of the self relevant characteristics of God mostly for self correctness (please note that here 'his' is a practiced metaphor and can be switched by a 'her' but that in no way is to paint any kind of human color to God). In Arabic though, Allah has no gendered noun identification, and it's a limitation of English expressionism God is not the best of substitute of Allah as God is a linguistic cleche' in English language representing the ancient Roman practice to identify with their kings as Sons of God. In contrast,

Allah in Arabic is an expression to identify with Al (what is) and Lah (What is not), an abstract but very logical understanding as to what God really is. Here for the simplification of English readership word God corresponds to Allah.

Following, I initiate a brief argumentation to identify the mathematical synonym to what it may mean by Allah or when Quran says Allah is a singular concept of infinite set of possibilities and characters. The argumentation carried out below is in context of finding the origin of a reality which existed before any thing known and perceived by humans today did exist and all that is to know what was the that '0' point from where all started. Following you would find a lucid explanation that finding that origin, one may only just prove the singularity (oneness) of God (Allah/Ellah) and how infinitely beautiful the concept is even if you just play a numbers game.

'1' how we understand it in a simple counting practice has a value which corresponds to character differentiation of an observation relative to its original point of reference. '1' is an estimated observation for a deterministic or identifiable existence. To our cognition '0' can only be identifiable by '1', and that would be only if we know that there is an observable '1'. Thus '1' attests and identifies itself only through '0', whereas to think of it '0' is not dependable on '1', rather '1' is dependable on '0'. In mathematics of number identification plus (+) and minus (-) may only refer to qualitative directions of identifications. However in a series of whole numbers there are no minus (-) values, which suggest that the point of origin in nature would always remain '0' in its quantitative or qualitative and deterministic or abstract forms. Nevertheless, once '0' is deterministic, there cannot be negative values to a mathematical series of number identifications. Only that in most integrating or differentiating analysis of real life observations, '0' is not really deterministic but mostly relative to the very surroundings and thus we need to identify numbers with explanatory values of addition or subtraction by means of + and -. Hence we move to integers rather than whole numbers to solve qualitative and quantitative notions of various universal observations.

Above is 3 dimensional basis of mathematics. But if I say God takes the value 0, how should one may deduct the exact understanding of the expression? As we know the abstract majesty of God, well explained to us through qualitative and quantitative notions of human cognition over thousands of years of recorded human history, we are able to understand well that God with representation of '0' only refers towards an effort for our own identification as '1', may it be our own life if we think it is

significantly different than others; 21st century if we think this time is significant than previous ones or coming ones; evolution of humanity till today if we think humans are the best natural outcome of life; evolution of life on earth if we identify biology with life; formation of our galaxy or others if we claim to understand as mentioned in Quran that even the stars and their derivatives dance on the set tunes to follow a set identified path of submission to the divine force; or the very initiation of this universe with a big bang if we think that universe must have a origin and thus entails some minimal of a multidimensional concept of existence as a 3 dimensional event of expansion. Thus we, who all contain a singular DNA characteristics and is '1' specie/creation of an abstract and also '1' God, are able to identify ourselves, yet still only be able to identify God through our own three dimensional understanding of the universe .

Interestingly in a three dimensional space where we exist, at one point in time to identify '0' or infinity, one may need a '1', while both '0' and infinity do not depend on '1' to take a certain value as '0' and infinity are both the same with values unknown to us in multidimensional space of qualitative identification of observations which should be true to a multidimensional universe utilized as a theoretical axiom in advance mathematics. The value of infinity is known if '1' is divided by that unknown number where it perfectly gives 0 for infinite iterations. Since simple additive counting of numbers suggests infinite or unknown possibilities of some infinite number solution may never be known to us as it is simply beyond our cognitive and spatial capacities. Thus, we only simplify to our best of knowledge and imagination as to convincingly assume to observe a '1' in a time sensitive three dimensional universe while making big bang our point of reference as the origin of the universe, while also knowing that the value of infinity can only be identified if we know what was '0', while also both being impossibilities as we neither know infinity and neither do we deterministically know what was before big bang initiated. Though one can question the validity of big bang by introducing a ring theory, where '0' and 'infinity' becomes same as the universe is moving in a time sensitive ring where even time takes the net change value of '0', here I would not challenge the larger wisdom in physics which substantiates the expansion of the universe as well as a start of the universe from a certain point of reference, but simple present the following mathematical paradox to substantiate my line of argument.

if 1/infinity = 0
1/0=infinity

then 1=0 x infinity

Here, we know that anything multiplied by '0' is '0'. It only takes infinite products of '0s' to make a '1' or it takes just a product of single '0' to make infinity equal to '1'. Thus here knowing the value of 0 is to know the value of infinity and then also to know what '1' stands for. Thus above is the mathematical expression of God's singularity. A simple mathematical rule of division would introduce a paradox to mathematics, once it was considered what number if put in a denominator would make a '1 = 0', and a simple realization was that '1' has to be divided by infinity to have a perfect '0' even if iterations of division are undertaken for infinite times as,

1/infinity=0.0000.....infinite0s=0

In other words it is just all 0s here, which just substantiates the fact that '0' is the basic code of God which even beats the mathematics, as we know of.

To know God a bit better, one has to delve into randomness, where the possibilities of unknown beat best of the human and what is known to him. And we delve into randomness for every day we live, every word we speak, and for every thought we think.

The words we speak are just sounds, and thoughts we think are just images of our daily observations, while they all only matter to the time we live in, otherwise our imaginations or our newly developed linguistic expressions may just mean nothing for some one who is not familiar with our language and who would neither associate with our self defined, self composed or self learned colors of surroundings. If so then it would become all the more interesting that every one of us, who at one point in time, say today, are 6 billion in numbers, would still remain equally significant to God. And here, I am just talking about the Earth how we know it, then also why not to imagine what possibilities one may discover if the entire universe with varying time sensitive capacities is taken into account while also not going beyond what we just simply cannot know and that is the exact point of reference to '0' and an exact number value to 'infinity'? So let's imagine to our capacities to find God with a mathematical limitation of 'n' observable possibilities within multi dimension settings of the universe and once done, should we not also believe in our modest existence to only submit our ignorance against his majestic being?

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3.
Art, music and science: Economics of inter-stellar travel

Consumer cognitive choices in product design

One of the most fascinating Hollywood Actor Jonny Depp likes to dress up like a gypsy and worlds most fascinating spy James Bond dresses up in a body fit texedo flying over cars, buildings and some times out of planes. Welcome to the lore of urban legends that the population of globalised world is exposed to through digital boxes of various kinds. Though majority of the global population is bereft of directly consuming the modern and high end fashion products that are show cased in these urban legends, nearly all of them would approve of it visually and go for second, third or nth grade/version of the product design they can get their hands to depending on their relative and respective purchasing power. This also means that aesthetic choices of consumers follow innovative designs and this comes to us naturally by our subconscious cognition. Be it auto mobiles, mobile technology, green energy or clothing etc, the innovative product design matters to consumers irrespective of demographic, racial, cultural, economic or religious orientation. Our deeper understanding of mother-nature and advent of technology are making product designs efficient, eco friendly, affordable and aesthetic. The dwellers of the modern world are readily utilizing and consuming products of different utilities to live a life of energy efficient comfort. However there are excluded and marginalized populations and they are no less in number that cannot afford the benefits of what scientific Industrial complex has to offer. For these marginalized segments, frameworks of social, economic and

political designs like Sustainable Development Goals are offered. Human rights are fundamental to not only our social, political and economic evolution but it has also been a key to finding the relationship of our technical progress with nature's eco system. Today we have been evolved in to a scientific society and we want the benefits of science to be utilized universally while catering to the intricacies of cultural, religious or sexual differentiations. The Industrial complex competes through intra industry product differentiation by focusing on cultural, religious and social histories of locations and inter industry product alignments take place through smooth supply chains. This way equity in product design differentiation takes place in service of consumers with common technical blue prints.

Music and interstellar contact

There is a proverb of contemporary global culture that music is the soul of humanity. Every culture has developed different musical tunes and with the advent of electrical instruments the tunes are making way to a common view amongst many of us that interstellar contact has taken place. Recently NASA has discovered that every heavenly object including billions of stars and their revolving planets has a peculiar sound frequency. Recently music industry has witnessed a rapid evolution with many different genres of music introduced to entertain the masses and sooth their souls. Is it that we are playing and singing the tunes of these interstellar heavenly objects that are contacting our cognition through peculiar frequencies through the channels of gravity waves? If so we are singing and dancing on the tunes of this universe and its beauty. The virtual applications like You Tube have made these tunes and their particular rhythm accessible to all who can access or receive internet. Providing free internet service through drones in regions like Africa by the likes of Facebook is positive externality of economics of technology.

Art versus science of interstellar travel: Case study of Space X Falcon mission

Recently SpaceX has sent a self driving sports car in deep space by launching its trade mark rocket that has capacity to be refueled after landing back on its launching pad. Sending of a sports car on such expensive aeronautical equipment was more than a fancy wish list of billionaire Elon Musk. Actually this odd decision had some good scientific thinking behind. Elon Musk also owns UBER that has pioneered in self driving cars/intelligent robotics. In order to create intelligent robotics not only the machine has to process

big data problems but it should be able to give unique solutions through self learning simulations. Automobiles are probably the most commonly used industrial invention of homo-sapiens to this date and these machines have evolved into intelligent self driving vehicles that can interact with others of their kind when most are driven by human subjects on the road. Well this is the most common evolution of technology on mother earth. The deep space utility of our most commonly witnessed technical evolution comes when it finds another planet with the right force of gravity housed by an intelligent life form that can appreciate this technology through their first hand relevant experience of their own. So it was a good decision to market Elon Musk vision of space travel and finding habitable planets.

Having said this, Elon Musk could have also sent a handmade carpet. Since many a centuries handmade carpets have been very popular in our homes that are especially made in Iran. Most commonly popular designs have octagon florals on it. Octagon florals give away our cognitive design understanding of multidimensional and over lapping status and secret of our universe imbibed with other possible ones. Octagon floral designs also frame the integration and derivation of infinite solution matrices by randomizing flat obstacles. (Bianca & Rondini, 2009) Many of these designs also brings a mathematicians attention to static or dynamic hexagon solutions so needed and utilized in cloud computing simulations and solutions.

Furthermore assuming if any intelligent specie in deep space finds a simple Iranian carpet, it would be most intrigued by an octagon floral and its randomly designed application in Mathematics and theoretical physics.

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4.
In between music concerts, jobs and economics: Case of youth empowerment in Pakistan

Household economics of Rock n Roll

By mid 1990s, Pakistan music industry made international news with many popular local music bands doing road shows inside and outside of the country. It was the era of live music in Pakistan where popular bands like Junoon (Passion), Vital Signs, Awaz (the Voice) and Strings attracted huge crowds from the youth to the concerts in the major cities of Pakistan. The music they made was the Pakistani version of Rock n Roll era while the message to the youth was of patriotism, Sufi philosophy and fusion of the East and the West (read cultural integration and globalization; see Ahmed, 2010). The music was all about enlightened moderation as a fact of every day life in Pakistan for the country's youth.

Came 14nth August every year, these bands released new songs and music videos on digital media that were followed by millions of youth in Pakistan singing these new tunes on the streets of the country in subsequent days. In between this singing and dancing, certain economic forces were at work too.

For example, the author was a teen ager in the mid 1990s and he religiously followed the music of these Rock bands like his millions of other peers. However, he could attend only a couple of their live concerts simply because the average ticket price used to be 10-15 dollars whereas his pocket money for the whole month amounted to 5 dollars. So like most of his peers, he could only enjoy the music on digital box.

This is despite the fact that the author tried to supplement his pocket money with some additional income by offering home tuitions. The part time job did fetch him additional 20-30 dollars but his consumption basket also expanded to include membership of a health club or occasional visit to high end brand shopping available to more affluent peers of his in those times in Pakistan.

1990s are associated with democratic precedence in the country with sluggish economic performance; multiplying of billions of dollars worth loans from International Financial Institutions; severe charges of corruption and economic mismanagement on elected governments and Sanctions over country's nuclear ambitions. As a result, budget deficits widened and inflation rate swelled. The purchasing power for an average Pakistani stumbled steeply.

So it was not a surprise that live music was more of an elitist feat despite its generic appeal and demand in Pakistan. The audience in the Road Shows declined with each passing day and bands were mostly doing them when they were sponsored by some commercial entity with the likes of Pepsi or Coca Cola. Because of poor economic management the fans (demand side economics) and the music bands (supply side economics) suffered financially.

And with passage of time, if anything the billions of dollars of loans multiplied and poor debt management continues to this day with most of the loans finding its way to the coffers of the corrupt. Most of the youth who find work in Pakistan do so in order to supplement the income within their house hold and not to economically empower themselves. Live music is nearly rolled back in Pakistan and music industry that is especially the voice of youth is only surviving at the fringes due to some level of commercial support.

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5.
Between gravity waves and business cycles: How to avoid global recessions

Manipulating business cycles to avoid recessions

Particles of light and matter from solar systems travel under random velocities by stretching gravity through interstellar time and space in shape of condense waves also reaching Earth. It is much like stretching a directionless spring to move a needle from point A to point B on a 360 degree space and time horizon. (please see for relational theoretical explanation; West, 1981) The phenomenon has an interesting application in Economics, especially understanding the multidimensional properties of business cycles and economic stretches within and their angular directions during their highs and troughs. The multi variable properties of the business cycles can be explained by economic, social, political and technical constructs with multidimensional causalities (Cooley, 1995). For example, war can dampen the trough by converting a recession into a depression or it can prevent the further dissent into trough. World War 1 caused the great depression of 1920s in the US, whereby the advent of industrial military complex during and after World War 2 enabled US and European economies to take up the path of booming stretch with higher levels of economic activity even changing the demographics in favor by creating a generation known as baby boomers consuming dividends of unhindered technical progress that is continuing to this day. Furthermore, financial and trade integration among developed countries have also prevented dampening of troughs in the business cycles while similar strategies caused some developing countries like China to sustain their economic position within the booming business cycle for

decades. For most developing countries, they have been indirect beneficiaries of global business cycle booms but could not endogenise the upward progress to their economic gain because they performed poorly on political and social fronts.

There is a visible dependency between global business cycles and the local ones due to liberalized economic policies that have been swiftly undertaken by all countries post Washington Consensus. So issues like regional peace, social and political empowerment and technical progress have become a common agenda for all countries irrespective of their geographic location. Initiatives like Sustainable Development Goals are suppose to smooth out troughs in local business cycles of developing South by improving the economic circumstances of its dwellers who then can become the ready consumers of the technical progress and innovation of progressing North.

The last couple of recessions (1998 and 2008) started in the US were not caused by economic agency but moral agency of doing business. (see Mamoon, 2017 for details). So ethics within a human genome to define purpose and outcomes of innovation become an important equation in the manipulation of business cycles to the benefit of boom. This line of argument is in opposition to the mainstream theories of Creative Destruction (Acemoglu) and Clash of Civilizations (Huntington, 2007) that try to optimize war and conflict among societies and between them as a solution for dampening troughs. Nevertheless creating an agile military industrial complex nationally in the likes of the Pentagon or the Red army may not contradict the ethical foundations of human progress if done for deterrence and not for imperialism. For example, the US and North Korea are talking peace within the region and outside after many hawkish exchanges between political leadership of both countries amid test of nuclear capabilities of the former. Similarly, some good decades have past in relative peace between India and Pakistan and both countries have avoided outright war despite continuous increase in hostilities after becoming nuclear and billions of dollars of investment in defense.

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6.
Technology case study: Virtual lifestyles and sustainable economic development

"Is information Technology going to widen the gap between the rich (those with Internet access) and the poor (those without access), or is it going to close it by becoming an opportunity lever for all?"… José Maria Figueres Olsen (President of Costa Rica).

Social and economic welfare and need for awareness

Knowledge, awareness and education are one of the imperative concepts for the empowerment of the people who fall within the different definitions of poverty. Never does a mere poverty alleviation policy can achieve its objective unless and until the poor themselves are engaged in the process of decision making. The world has learnt this lesson especially in the 1980s and 1990s, when growth was assumed to trickle down to alleviate poverty. As the neoliberal paradigm lead to liberalization of markets in developing countries, the world did saw many of them performing well on the growth front e.g. China and India, but it is highly controversial whether that growth has also lead to significant poverty alleviation.: 'if China is excluded, poverty appears to have declined in developing and transitional world by a meager 0.18 percent points a year between 1987 and 1998, whereas over the last two decades, inequality has risen in most of the developing countries (Cornia & Court, 2001).' Thus it is no surprise that the inception of new millennium has witnessed an increased importance to such policy options of poverty alleviation which directly engage the poor in the process e.g., the micro-finance schemes following the prototype of Grameen bank is probably the most widely used policy tool where the problem of poverty is dealt with at grass roots level by empowering the low income groups in the society in a most debonair manner by providing them monetary resource to enable them achieve a decent

and proper livelihood. Thus micro- finance is a mode to empower the poor in monetary terms.

2. However, poverty is much more than just a mere monetary/quantitative concept. Being not able to get basic facilities from education to health also indicates towards poverty and deprivation. Social exclusion, Gender discrimination and violation of rights are all qualitative, and more important and intricate forms of poverty. Thus one can safely say that all forms of powerlessness are poverty. Thus the understanding of the determinants of powerlessness is imperative to propose a dynamic poverty reduction strategy.

Before 1950's, human capital as a term did not even exist when economists saw capital as the machines, the tools and the money. Then the concept of capital got wider to human capital and it was not until recently years that people began to speak also about social and cultural capital. Mainly it is by investment in education and training that human capital can be developed and improved. Therefore it depends on how much interest a country puts on education for people. On the way to economic development, human capital has also a major influence that in return depends on the human knowledge, on the human capabilities and on the health of the population.

Currently, there is lot of public sector emphasis on human capital. It is recognized as an important and useful element through which development can be achieved. Human capital among other factors such as agrarian reforms made the so-called South Asian model to become successful. This region puts a lot of emphasis on human capital concentrating on primary education and primary health. Especially in India, this has created a relatively healthy and skilled labor force, which together with an equal land distribution led to a very favorable scenario for high rates of economic development and economic growth.

Lifestyle in technology

Last century has witnessed a rapid progression of human society from Industrial Revolution to Technology boom. Since last couple of decades, Western countries have become more service oriented where as new technologies are increasingly applied as means to bring efficient electronic transformation to consumer and business activities. However, now the world is also divided into capital intensive production activities and labor intensive produce where the later being a trend dominant in Southern economic system. This divide between efficient resource procurement would then trickle down to create economic and technology divide between the North and the South, as we witness it today. Western

life styles are increasingly becoming a matter of science fiction for most of the down trodden populations of the East, who in larger cases are still struggling to make both ends meet even if most survive above extreme poverty levels.

In this context and with increasing populations skewed towards developing countries, fair development practices would mean increase in global produce of consumption and industrial goods to cater to the billions who dwell in modest economic circumstances. This is exactly what new economic, technology and corporate global strategies intend to do. Improvements in the livelihoods of larger populations in developing countries by means of economic and social empowerment would not only lead to fair development but would also create further demand for high technology production systems and products. Thus, consumerism is the future. Though, in the short to medium term, the world will be divided into three groups: 1. Countries with high end technology, 2. Countries with medium technology level and mix of labor and capital intensive production systems, 3. Countries with low end technologies or labor intensive production systems. More and more developing countries want to lie in category 2, much like India and China. Both countries have seen high levels of growth rates with significant poverty alleviation as more Northern Industries are relocating their businesses in these countries to cut their costs.

In other words, in this era of technology boom and smart economic and corporate strategies, supply through cost minimization would always create demand substantiating basic New Classical theorem known as 'Says Law' against Keynesian wisdom. With current trends of economic and financial development and high growth performance in many developing countries, one may quite evidently witness that consumerism is becoming the order of the day especially in urban areas, who are the key facilitators to Western outsourcing stint. Where ever, the economies are performing well in the South, more and more people are taking up goodies of capitalism by consuming low end technical products like mobile technology and alike. Simultaneously, credit creation through electronic banking as a formal financial tool of investment and consumption is becoming more frequent in the South facilitating smoother consumption practices. Even Western countries are witnessing boom in consumerism as the public now has access to cheaper goods due to outsourcing by many a multinational companies in order to decrease their costs.

Not so surprisingly then, global economics is working much against the basic micro economic methodology where producer supplies more if prices are increased. Here producers are looking

for cheaper ways to produce their goods and compete with other brands in not only quality but cost efficiency to grab a larger chunk of consumers. In the garb of outsourcing, significant technology transfer may also be happening in the South. Though as of now, outsourcing is more happening in low end technological products in most cases i.e., textiles and automobile industries. High end telecommunications, financial or energy sector activities are primarily carried out in few developing countries like China or India, where technological base is some what more developed than most developing countries. Some countries like Pakistan, Thailand, Indonesia, Malaysia, South Africa, Arab Emirates and Costa Rica etc are jumping into the technological band wagon due to the availability of comparatively higher levels of human capital.

In line with these trends, these days in corporate and energy sectors, technology and innovation is the new buzz word for the futuristic world. However, increase in incidences of poverty and inequality in the larger South as well as worsening of global environmental problem has forced the governments and corporations globally to re-evaluate their technology, industrial, economic and energy policies. With advent of new Millennium, international bodies like United Nations, World Bank, International Monetary Fund, World Trade Organization have recognized the importance of sustainable development and initiated Millennium Development Goals, Poverty Reduction Strategies and Fair Trade all in an effort to device combinations of corporate and development strategies which may lead to economic and technological progress of both North and the South on fair basis, while production activities would become more environmental friendly.

Social application of technology

Corporate social responsibility (CSR) is one of the many out comes of this focus where multinationals, especially the ones who are working in developing countries, are expected to follow their production activities in a manner that they would not cause harm to the welfare of the immediate neighbor hood where their production activity is based. Further more, they are also expected not to exploit lax environmental regulations in the country they are operating as many developing countries in an effort to attract foreign investments have been found to ignore environmental consequences of intensive industrial activities in order to make it cheaper for many foreign firms to work. Nearly all large multinationals have started their own CSR initiatives where sustainable energy consumption is encouraged and many health and education related or cultural activities in developing countries

are conducted or encouraged through financial aid to the relevant local organizations, local governments or by means of directly installing facilities like schools and health care centers.

One such major initiative in many developing countries, by many a high technology or energy multinationals, has been the promotion of information technology among the rural populations with help of local and international education institutions. For example, recently in Bolivia Microsoft has helped the Bolivian government to introduce digital age to its people by developing software which translates windows into one of the widely spoken regional language Quechua and further plan to translate windows into approximately 47 other regional languages. Microsoft has also helped the government to provide basic digital facilities to rural areas so that the soft ware is utilized by common people around the country. Quechua people are one of the poorest and ignored populace in Bolivia with highest levels of illiteracy. The idea is to educate the people with digital technology as they are expected to access World Wide Web for their interests and entertainment, while indirectly getting a virtual exposure to larger world which is not possible in their real lives due to their economic circumstances.

Thus such initiatives have vast implications in efficient education and information dissemination through enhanced awareness of populations which due to their impoverished livelihoods may fail to inform themselves with the advantages of the new changing world in any other way. Cyber world is a technology heaven where through means of mere knowledge of contemporary human progression and it's cultural and indigenous diversity, tolerance, logic and rationality may be promoted.

Tourism has always been one of the best ways through which we embrace ourselves to the richness of the diversity among cultures and learning practices. In today's world by means of efficient and safer modes of transport, tourism has transformed into a multi billion dollar industry itself. The nations who have better knowledge and understanding of different cultures are also the ones which are more developed. It is also a subtle means to relate to one's own culture in its contemporary and historic context. Thus a world which is increasingly associated with the term 'Global Village', asks us to recognize and respect its cultural diversity. Tourism has a significant social contribution in constructing an intellectual society where people may relate to the larger world in similar respect as they relate to their own societies.

Case of virtual tourism in Pakistan

In Pakistan tourism has yet to become a common practice. Large segments of the society still fail to afford to incur distant

pleasure trips. In rural areas, the best pleasure excursion by the common man would be to view and enjoy the natural landscapes of the country, whereas availability of museums or preserved cultural and historic sights is rarity. However, the government is increasingly trying to improve the situation mainly with help of civil society and foreign donors or multinationals. This will definitely serve a good purpose.

The government also needs to promote information technology and initiatives similar to the one in Bolivia as a matter of its indigenous tourism policy. Bringing a PC to a rural locality, where many must have never traveled furthest than a few miles from their homes, would bring instant global information to their doorsteps. Secondly, detailed websites of Pakistan's many a museums and historic places need to be developed where artifacts or historic spots are covered in detail in pictures. As they say a good image is better than thousand words. What best and efficient way to disseminate and promote indigenous culture and practices than to have some good cultural websites, especially in case of a country where due to harsh economic circumstances many may not afford distant pleasure trips? Information technology is a common culture of the future. In this back ground, privatization and development of telecommunication sector in Pakistan has been timely and in future the country is in good position to exploit information technology to build a vibrant and aware society.

Virtual tourism also makes a good economic sense and helps the case for sustainable development. In today's world where population has exceeded the figure of 3 billion, conventional tourism might have a strong environmental short fall in a scenario where more people would commute to farther locations to make pleasure trips. Virtual tourism is an efficient substitute for conventional tourism. As computer technology is leaping towards far more advanced imagery technologies, virtual tourism is here to prosper and for all the right reasons.

Virtual Tourism applies not only with presenting the social, economic and natural landscape of country like Pakistan to outside world but an indigenous digital foot print also means development of applications and technologies locally that can create opportunity of social, political and economic interaction in the world wide web with the likes of face book, twitter, Amazon and Ali Baba.

Welfare impact of virtual technologies: Costa Rican case study

3. In the last 10 years, the Costa Rica gap between the rich and poor people has progressively become smaller. By 1990 the 27% of the population was below the poverty limit while in 1998 it was

19.7% from the total population. For this new century the Costa Rica governments have been trying to reduce this gap by introducing programs and projects that provide better opportunities for all its residents. This is mainly the case for the rural areas, since those are usually the communities that are having problems to improve their opportunities that allow them to enhance their personal development.

4. Over the 50% of the Costa Rica territory is classify as rural part, at the same time many areas from those sectors lack the tools to overcome many of the problems they have to deal with. Hence the necessity to decentralize the administrative part becomes a principal requirement to promote communities' development and to obtain a better use of the local resources so people can get the capacity to overcome their problems.

Therefore the improvement and creation of educational programs is an important key to ensure the human capital that is needed for a local economic activity diversification that allows for different sources of employment. In recent years, a series of initiatives related to the application of informative technology has been pushed. All of these initiatives have the common objective to "democratize" the use of these technologies, and thereby make them accessible for the majority of people. The Costa Rica Foundation for Sustainable Development, directed by José María Figueres Olsen, President of the Republic of Costa Rica (1994-1998), has begun to work on a concrete and highly applicable solution. In 1998, the Foundation underwent serious and intense investigation and as a result, the program LINCOS (Little Intelligent Communities) was presented. The objective was to interconnect the people through new technologies, and to covert communities into a form which would better prepare them to face the challenges of globalization, instead of just leaving them behind.

LINCOS (Little Intelligent Communities) is a second-generation project for marginalized communities in developing countries where single technology platform units with multiple information technologies are integrated. The units are equipped with a group of multifunctional applications, each of which is briefly described as follows:

- ✓ Health and environment components, through which TV medicine, water source and soil samples are offered.
- ✓ An educational information lab equipped with computers connected to the Internet, a printer, a scanner and other services provided, such as personal teleconferences.
- ✓ A videoconference component to bring long distance education through pre-recorded videos or closed circuit TV programs.

- ✓ This group of primarily educational features will be linked with the entertainment activities to create " The Community Center of the New Century".
- ✓ These units in full operation could service over 4.000 people per month.

The beneficiary parties from this initiative are primarily marginal urban communities and rural areas, which do not have access to technology platforms and other basic services. Students from elementary and high school education between 7 and 17 years of age, community adults, small and medium size farmers (producers), local small business, and healthcare services personnel are beneficiaries. Following benefits were observed in these communities in Costa Rica:

- ✓ generation of employment in the communities
- ✓ improved education for students and locals in the community through the access of technology resources through computers
- ✓ the establishment of alternative channels for commercializing goods and services in the communities through Internet
- ✓ early disease detection, diminishing the pressure in already constraint community health services,
- ✓ future improvement of opportunities for girls and boys,
- ✓ the improvement in the quality of life for its inhabitants and economic development for the community.

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7.
Principle-agent analysis of technology Project (LINCOS) in Costa Rica

Introduction

Today, when the technological revolution is transforming the lives of those who are connected to it, the issue of access to information technology is becoming increasingly relevant in every part of the world. Thus it is indispensable for a country to be prepared for such changes (Human Development Report, 2001). Costa Rica is one of the smaller Latin American countries, inhabited by only 4 million people. However, it is one of the more developed Latin American nations, known for its social and cultural homogeneity, political stability and democratic traditions. It is also one of the few countries in the world that does not have an army and instead, since 1949, successive governments have channeled public resources to the improvement of general public welfare rather than using them on amassing weaponry. Thus it is not a surprise that today Costa Rica is one of the more developed countries among its regional counterparts, with superior social and human development indicators (refer to Table 1) that it is definitely a fine example to follow (Garnier 1998; Human Development Report, 2001).

Table 1. *Indicators of the Evolution of Social Development in Costa Rica 1940-2000*

Indicator	1940	1950	1960	1970	1980	1990	2000
Adult Illiteracy (% of population older than 15 years old)	27.0	21.0	16.0	13.0	10.0	7.0	4.0*
Years of Education (for more than 25 years old)	n.a.	3.1	3.6	5.3	5.9	6.5	6.7*
Life Expectancy (years)	46.9	55.6	62.5	65.4	72.6	75.6	77.4*
Infant Mortality (1000 births)	137.0	95.0	80.0	67.0	21.0	15	10.2*
Human Development Index (%)	n.a.	n.a.	55.0	64.7	74.6	84.8	79.7*

Note: n.a.: Not available. **Source:** Garnier *et al.*, 1998; *Estado de la Nación, 2004.

In the technology sphere, the country has also achieved positive technology introductions as suggested in the 2001 Human Development Report; Costa Rica has developed its human capital to utilize these new technologies efficiently. In effect, as the Human Development Index shows, the country had shifted from a medium human development level to a high one of almost 80% in the year 2000. For the same year, the illiteracy rate was merely 4 percentage points (Garnier *et al.*, 1998; Estado de la Nación, 2004) indicating an educated environment, and this has boosted the use of 'new' technologies.

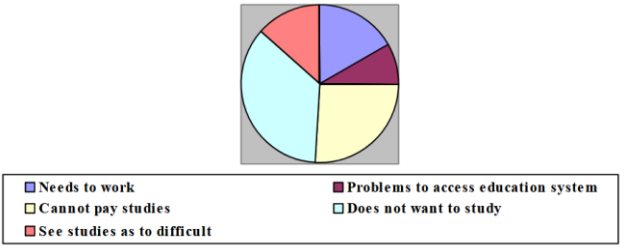
Irrespective of these overall national achievements apropos economic development, one is confronted with a different reality when inter-regional differences are taken into account because significant inequalities prevail between urban and rural areas of Costa Rica.

Table 2. *Percentage of School Attendance for the Population over 5 years, per Region and Sex*

		Costa Rica		Urban Region		Rural Region	
Age Groups	Total	Men	Women	Men	Women	Men	Women
5-6 years old	64.6	64.4	64.8	72.1	72.3	55.4	56.0
7-12 years old	95.7	95.5	95.9	97.3	97.5	93.3	93.8
13-19 years old	61.3	59.9	62.7	69.0	71.3	47.7	50.4
20-29 years old	22.8	21.9	23.7	28.2	29.6	12.5	14.4
30 years old and more	4.6	4.4	4.9	5.8	5.9	2.5	3.0

Source: Population Census 2000, INEC

For example, Table 2 shows that, out of the rural population aged between 25 and 49, more than two thirds barely have 6 years of schooling, whereas in urban areas the corresponding figure is less than one third. One of major reasons for this situation is the fact that people do not have enough financial resources to afford education (refer to Graph 1) (Estado de la Nación, 2000:87). One way to make education accessible to the rural poor is to make it cheaper and efficient by utilizing 'new' technologies.



Graph 1. *Various Causes of Non-School Attendance of the Population between 5 and 17 years of age*
Source: Households surveys, INEC, 2000.

There is a greater need of technologies that can provide access to information, especially in the rural areas, and to reduce the digital divide.[i] Information and Communication Technologies (ICTs) can be identified as such technologies which, under the right conditions (for example, effective use of it and equal access to it), can not only improve the skills of the targeted population through better knowledge but also enable them to have better income opportunities (Schech 2002; Rodriguez 2001; Colle 2000; Escobar 1995). However, rural areas generally lack easy access to these Information and Communication Technologies (ICTs) because of complex conditions. For example, because of their remote geographical locations most rural areas have poor infrastructure, which makes it difficult for the availability of ICTs (Okot-Uma, 1992 cited by Ghimire, 1997). Therefore ICT provision to rural areas is generally a challenge and a tough task. But it is necessary to take up this challenge because ICTs are cheaper and efficient modes of knowledge dissemination, and this is a pre-requisite for the improvement in rural livelihoods.

Yet, the provision of ICTs generally involves many actors and as a result quite many processes. These actors can be the State, a Northern NGO, a Southern NGO or both and/or local communities, and these actors interact with each other at various stages of a standard ICT project. In an effort to identify the most efficient ways of ICT provision, one has to critically evaluate the role of these actors individually and/or in a group. For example, it is imperative to know how different intermediaries[ii] as non-governmental organizations (NGOs) come into action to play a role in the transfer of technology by implementing ICT projects that can facilitate the access to various technology tools in areas where technology introduction is difficult (Colle, 2000).

This paper intends to look at one such intermediary NGO in Costa Rica, namely the Costa Rican Foundation for Sustainable Development (CRFSD). This Foundation is an idea of the former

president of Costa Rica, Jose María Figueres Olsen who initiated an ICT project called 'the Little Intelligent Communities' (LINCOS). CRFSD has also involved various national and international aid agencies /donors in the promotion of its project.

As a result, the CRFSD has to go through different steps before each LINCOS project is finally implemented and considered ready for its use by the targeted population. These steps form the project chain, which covers all the processes that a project has to deal with, making up for the complete institutional arrangement whereby different relationships and interests are covered and roles of different actors involved are identified.

The major focus of the study is to identify relationships between the various actors involved in a standard LINCOS project and the way in which those relationships may have influenced the efficiency of the project by looking at all the actors involved and the course of actions taken by them.

There are 'hard'factors or material infrastructure requirements (e.g. components of electricity, hardware and software platforms) to provide access to ICTs, and there is also a need for the so-called 'soft' infrastructure (e.g. financial and negotiation factors) to support the diffusion and the use of these technologies (Chepaitis, 2002). This paper centers its attention on the soft factors, which construct the institutional arrangement and, in particular, it examines the relationship between the different actors involved in the ICT project.[iii]

For a better understanding, a graphic representation of the ICT project chain is presented in figure 1 in appendix A. The chain provides a general overview of different actors and processes involved in every step of the ICT project. Following the steps identified in this ICT project chain, the paper attempts to show if the different actors are meeting the project's objectives and if they all have same objectives. This will also provide us with the information to know how every step has defined the actual purpose of the project, even though the purpose may be officially the same.

In this chain analysis, the paper seeks to identify the role played by the actors, giving special emphasis to the NGO (CRFSD) and its relationships with the donors[iv], State[v] and with the LINCOS' management membership based organization (MBO). To this end, we can consider the positive connotations and different problems that arise from different actors' interventions. Such an approach will help me to identify if some actors can lead to the creation of new relationships of dependency, where some of them may have more power to take decisions and impose conditionality on the others.

Since it is anticipated that (as it is the case now) the majority of the world's rural population will not own ICTs in the near future and most will probably not be direct users of ICTs - many countries are trying to reverse such trends. ICTs are identified as an important means of sustainable development and efficiency in communities - be they rural or urban.

To this effect, in many developing countries, a wide range of organizations –national and international- are promoting and supporting the creation of entities that can make ICTs available on an affordable basis to everyone. Much of this attention is now on "NGOs and their initiatives toward applying ICTs and telecenters toward development" (Colle, 2000:4).

In this paper, evaluation of the CRFSD as one of those intermediary entities, and the analysis of its ICT project is used to understand what steps are involved in a project before people get access to it. As mentioned earlier, an ICT project entails a chain of different steps and actors before its outputs reach recipients. The analysis of any such steps that allow the information to flow from a 'top' initiative idea to the 'bottom'- to hitherto disconnected people - provides a useful framework for any efficient ICT project implementation. Such an approach gives an understanding of the processes that may delay or accelerate the ICT connectivity to the rural people.

In short, ICT projects are worth analyzing to understand the institutional arrangement that lies behind them, especially since the analysis of such partnerships and relationships in ICT projects have not been covered extensively by the existing literature (Brehm, 2001).

It was possible for me to gather good background knowledge about my case study as I have been working with the CFRSD. It has been both a challenge and a moving learning exercise to explore the relationships between the NGO and the donors, the state and the community management based organization (MBO) as actors involved in LINCOS.

The objectives of this study are to:

a) Identify those steps in the structure of the project that may delay or accelerate the access of information to the targeted population;

b) Analyze the NGO objectives in relation to those of its partners, donors, State and the community organization (MBO) involved. (Does everybody want the same thing? Do objectives of the NGO clash with those of the donors and do these differences influence the objectives of the NGO? How are actors influencing the project?)

This research seeks to examine some of the factors thatmay inhibit or foster access to ICTs. There will be a further focus on other specific sub-questions:

a) How do objectives of the ICT project flow among the actors and why? (What happens at the end of this process?

b) What factors in the institutional arrangement account for the delay or progress of the ICT project and why? (How long does it take, what does it mean in terms of time and why? i.e. contract agreements, requirements, etc)

c) Are changes in the project, if any, caused because the presence or absence of particular actor/s (i.e., donors/state)?

Methodology

This study is based mainly on secondary data to illustrate the case of the steps involved behind an ICT project and its analysis with a principal-agent perspective.[vi] Principal-agent theory is been chosen because it can identify different relationships among actors involved (Stiglitz, 1998). Whereas, the role of these actors may depend on who sets up the rules and which one is willing to accept them. As a result, sometimes the interests of a principal (the donors) can influence the interests/objectives of the agent (NGOs). This is because there may be uneven situations of information from one actor to the other (Stiglitz, 1998). It is therefore important to look at the objectives of the project to understand if they match with the interests of the particular actors involved.

Principal-agent theory also helps to understand the role of each actor, shedding light on the reasons why their objectives are similar or different. There can also be the case (depending on the circumstances) that an actor that is playing the role of a principal becomes the agent for another actor and similarly the agent becomes the principal for another actor. Such a situation will most probably arise while moving down to another stage on the ICT chain. In short, by using principal-agent methodology, the paper tries to analyze whether the original objective of any ICT project changes because of the actions taken by different actors in different stages.

The secondary data for the analysis has been collected through literature review from websites and library materials in the Netherlands. The case study was assessed on the basis of published and unpublished reports, articles, and other material from the studied NGO. Also, some primary data was gathered by interviews and email communications with the main actors involved in the project, by arranged contact from the NGO.

Since the study concentrates on the soft structure of information access of an ICT project, it does not look at the impact of this

project in the communities. Therefore, the paper does not pay major attention to the positions of the communities or the beneficiaries' reaction and the way they will make use of the information and communication technologies. Rather, it focuses on the ways in which these ICT services are provided to the people that need the information in the shortest possible time that facilitates the *service delivery.*[vii] Looking at the way actors operate will assess this service delivery. Therefore, this research will also be of help for anyone interested in the role of the actors behind any NGO project.

Since this work is based mainly on secondary data with the use of the CRFSD project' files, it is imperative to acknowledge that I myself did not participate in the process of the material creation, which may lead me to diverse conclusion problems. Also, there is always the possibility of not having access to some information, even though all the previous negotiation was carried out. The key concepts of the study are: Information and Communication Technologies (ICTs), Non-Governmental Organizations (NGOs) - as the ICTs performer of the presented case- and their relationships with Donors, State, and MBOs. This is evaluated with a Principal-Agent Theory Analysis.

Defining information and communication technologies (ICTs) through literature

"ICT encompass all those technologies that enable the handling of information and facilitate different forms of communication among human actors, between human beings and electronic systems, and among electronic systems" (Hamelink, 1997:3). This technology 'reflects the convergence of digital computing and telecommunications' (Heeks, 2002:1), which are the means to serve the goals of the information handling and communication. Different 'old' and 'new'devices for the information delivery such as computer, radio, and telephones among others, can hold the use of this technology.

It is widely believed that ICTs are a means to enhance people's well-being (Heeks, 2002; Schech, 2002; Colombo, 1989). This public welfare is achieved through knowledge sharing that enables people to improve their skills as a means for empowerment. This empowerment extends opportunities for employment, which will improve their life conditions. Evidence indicates that 'ICTs can be highly beneficial to individual communities, projects and countries as under the right circumstances ICTs can improve education, health, job creation, governance and other services' (Rodriguez, 2000:5).

However, merely acknowledging that information can provide many opportunities for those who need it is not enough. This information should be provided as effectively as possible. There is the belief that for an effective usage of ICTs, the question of digital divide has to be addressed by incurring extensive investment in the ICT infrastructure. The second critical step is to shift from learning to 'learning-to-learn', as in the age of modern ICTs, most information is on-line, and what is really required is the skill to know what to look for, how to retrieve it, how to process it and how to use it, thus transforming information into knowledge and knowledge into action (Castells, 2001). Only after such actions, which lead to the provision and optimal utilization of ICTs, can it be said that information technology causes social well-being.

Yet, this involves many underlying assumptions. The most vulnerable set of assumptions for ICTs to provide benefits for all people, especially the needy ones, is that the information technology should not only be equally available to the people from all the stratum of income, but that they are also well capable of utilizing it. These assumptions do not hold in reality. Firstly, there is an enormous and augmenting partition between the have and have not of ICT infrastructure. As Saith so aptly states:

> "The empirical evidence, revised as it is continuously in order to keep track of a fast moving target, all confirm the existence of a chiasmic divide: this applies to the different elements of ICTs; and then for comparisons between continental regions; within advanced and poor economies; within each country to the enormous gaps between rural and urban populations; within urban regions to wide divide between the megapolitan centres and large cities on the one hand and the small towns on the other; within cities to the different categories of suburbs that house different social groups" (2001:4).

Thus, there is a clear case of digital divide between and within countries and where variations of the wealth distribution are noticeably from rural to urban, which hampers the effectiveness of ICTs (Castells, 2001; Colle, 2000).

Additionally, illiteracy problems and social discrimination prevailing in societies limit the use of ICTs even where they are made accessible to a common person: 'Since ICT skills are largely based on literacy, it seems that the vast majority of the illiterate population which are largely poor will be excluded from the emerging knowledge societies, whereas the worse shall be women who constitute the major chunk of illiterates in the world' (Hamelink, 2000).

Here then, the question that arises is why there is still a profound gap between technology needs and availability in rural areas? How can ICTs fill the gap in those deficit areas? These questions lead to a major concern with who is implementing ICTs and in what way it is implemented? Since it may be the case that, despite good intentions regarding a project, some actors are not playing properly their role.

To this effect, in order to examine the ways in which ICTs can be delivered to people, one has to look at the role of the different *intermediaries* that play a crucial role in its service delivery strategy. These intermediaries can be broadly identified as NGOs, Donors and the State. Before analyzing the role of these actors in ICT development, it is useful to first understand their general role in the social and economic development of a country and also how these actors are linked with each other in an institutional framework for the promotion and implementation of a development project.

What are non-governmental organizations (NGOs)?

According to many authors, NGOs have become important actors in the last decades (Biekart, 1999; Edwards & Fowler 2002; Carroll, 1992; Korten, 1990; Padrón, 1982, Macdonald, 1997; Smillie, 1995; Thomas & Allen 2000) serving as intermediaries for donor agencies and governments by having a strong presence in needy communities around the world.

It is important when analyzing NGOs to understand how accountable they can be to the people they are helping. However, a critical definition of NGOs and their distinctions must be presented first.

It is difficult to find an adequate definition of NGOs. They embrace also many different organizations ranging from "political action committees to sport clubs" (Carroll, 1992).

Therefore, a special distinction of NGOs is made between those organizations performing developmental assistance and those involved with social commitment in "grassroots work". The former are grassroots support organizations (GSO), which are NGOs providing assistance to different communities as intermediary agencies (Carroll, 1992). For some authors, these organizations are also known as non-governmental development organizations (NGDO), which are also within the NGOs category but with an attitude more towards development (Padrón, 1982).

Grassroots organizations (GRO) on the other hand are NGOs that are not working at the supra regional level as GSO. They are only concerned with their own community assistance, thus seen as community organizations (Arrosi *et al.* 1999) or 'peoples'

organizations' (Korten, 1990). Within these GROs there are grassroots based organizations (GBOs) and membership organizations (MO) (i.e. member based organizations (MBOs), whereas the main differences between this group and the GSO lies in the way they gain their support and their accountability structures. GRO followers also call them self-help groups, since they are entities that gather their results by making use of their own resources and by assisting their own organization or community. Arrosi *et al.* define self-help as the following:

> …any action undertaken by an individual or group of persons, which aims at the satisfaction of individual or collective needs or aspirations. The distinctive feature of a self-help initiative or activity is the substantial contribution made from the individual's or group's own resources in terms of labor, capital, land and /or entrepreneurial skills… a self-help group is also a membership organization which implies that its risk, costs and benefits are shared among its members on an equitable basis and that its leadership and /or manager liable to be called to account by membership for their deeds' (1994:45).

There are a wide variety of classifications according to the nature of entity; NGOs can also be grouped as northern non-governmental organization (NNGO) or southern non-governmental organization (SNGO) depending on their headquarters' location or from where the assistance is coming from (Bebbington & Farrington 1991 in Bebbington *et al.* 1993).

Furthermore as the term indicates, non-governmental organizations are not entities from government, though in reality many NGOs receive funds mainly from them (Thomas & Allen, 2000). They become contractors and not independent actors, since most are not financially self-sufficient but in need of resources. The same situation is seen with donors and NGO relationships. NGOs have been acting as intermediaries in developing countries where government or donor funds are available, becoming implementing agencies for big donors in the *aid* chain (Biekart, 1999).

Apart from understanding the typology of NGOs, an evaluation of their work should be offered since there are many examples that can be attributed as positive and negative effects from the work of NGOs.

NGOs aim to alleviate problems present in the majority of developing countries, especially in rural development (OECD, 1998). Even though these problems can be attributed to different circumstances, NGOs have developed different networks to

improve any existing situation. Today, their work is concentrated in the help they can provide to community development. This assistance can be direct or indirect by providing resources that were lost by natural disasters or by the introduction and implementation of projects to impact a large range number of people. Also, communities are relying on them to gain access to resources because of the lobbing capacity that many NGOs have, (Riddell & Robinson 1995).

However, in the majority of cases these NGOs' projects are pre-designed and implemented in the same way all throughout communities. This is because in some cases NGOs act as intermediaries to northern organizations or donors that want to utilize the same project models in south countries. Hence, the project may not have positive impacts (such as local ownership) because of different characteristics and necessities of the place where it will be implemented as compare with the one where it was first set. As a result, different situations such as cultural and political factors can show the disapproval of some NGOs' work (Rozendal, 2003).Besides, many times project developers are not considering other aspects such as remunerations schemes, which have negative aspects when leaving apart. As Riddell and Robinson suggests "well-trained field staff, motivated by a reasonable level of remuneration and committed to the goals of the organization, clearly play a critical role in successful interventions… poorly paid staff have cause to be less committed to the projects they are managing or executing, and will be tempted to spend more project time engaged in moonlighting activities" (1995:71). Finally and in contrast, projects should not leave behind the idea that "too many staff will have objectives that are too broad and shallow" (Heeks & Baark, 1998:26).

Consequently, for a better perception there should also be an assessment on NGOs accountability.[viii] Here, the question is to whom NGOs are accountable? Are they accountable to their partners, to the communities they target, to donors, to governments, or to the coordination bodies in which they participate? To some extent they are accountable to all of them, but the unequal power relations they engage in must be acknowledged (Carusi, 2003:11). As Thomas & Allen have stated, "NGOs are in practice more accountable to their donors than they are to the beneficiaries" (2000:213). Biekart (1999) also argues that in the aid chain the most powerful actors are donors (i.e. northern governments) at the top of the aid chain and they control strategic decisions in the negotiation process.

INTRAC work describes this accountability issue by pointing out their concerns for the way in which, some local NGOs are being held accountable by communities:

> "After initial enthusiasm for supporting local NGOs as intermediaries to empower the popular organizations of Civil Society, questions are now being asked about their accountability to these organizations. Might they even weaken Civil Society? Have we witnessed a disproportionate support for local NGOs at the expense of popular organizations… making the latter dependent on local NGOs as intermediaries for access to resources? Local NGOs increasingly tend to present popular organizations in policy discussions with donors and, in turn, have attached a professional middle-class cadre of 'experts'. By funding and promoting local NGOs, are we in danger not only of encouraging opportunism but also of undermining even the more productive role that government might play in developing countries?" (Bennett & Gibbs, 1996:4).

On the whole,NGOs' ties to some actors may lead them to different priorities where the course of projects get changed or interrupted. Hence, this difference of priorities that may be present in the institutional arrangement is what calls for the analysis of the relationships among different actors.

NGOs, state and donors: An overview

After going through the above analysis, in this paper NGO refers to organizations that engage in providing support to different communities. Therefore, the Costa Rica Foundation for Sustainable Development (CRFSD) refers to a grassroots support organization (GSO) or Southern NGO (SNGO), and the LINCOS community administrative organization is referred to GRO, or MBO definition.

After the end of cold war, bilateral and multilateral lending agencies have pursued a so- called 'New Policy Agenda[ix]' that identifies NGOs such as GROs as one of the most prominent means for poverty alleviation, social welfare, democratization and healthy civil society. They are also considered to be key channels for the promotion of pluralism and human rights protection.

At the same time, the developing country states are viewed by these aid agencies as generally lacking resources or commitment to ensure universal coverage of social welfare for the public. Furthermore, the state' failures are attributed to their interventionist policies. For example, in 'rural development projects', the tendency for state institutions to centralize decision-making led to growing classes of urban-based functionaries, hierarchical decision making and so reduced flexibility and

responsiveness and to inappropriate and slow program implementation at local level (Ahmad, 2000:15).In short, there are state failures in many developing countries due to an inefficient allocation of resources at national level, and particularly to rural and urban sectors and private and public sectors. In view of the good history of NGOs in providing welfare services to the poor people in those countries where governments failed to ensure universal coverage in health, education and security, the new liberal paradigm has scrapped the Keynesian model of development where the state and its agencies were assumed to be the key vehicles through which projects and policies were implemented.

Traditionally, donor finance has been channeled into various development projects through NNGOs. However, this trend is increasingly changing as the SNGOs' competence and capacity is improving. Now, SNGOs increasingly receive funds from many different sources including NNGO partners, international foundations and official bilateral and multilateral donors, whereas donors also support SNGOs indirectly through NNGOs. The change of focus from NNGOs to SNGOs is also due to the fact that this arrangement suits both donors and the developing country state. Donors prefer SNGOs because they are assumed to be more accountable, better performers, and more effective in strengthening civil society in the South than their Northern counterparts (Bebbington & Riddell 1994).

In the case of NNGOs, the developing country state does not have much leverage to address these concerns and might consider their actions a threat to its legitimacy or sovereignty. Many NNGOs look to influence southern state policies through operational collaboration, lobbying and advocacy. On the other hand, a range of interventions can be used by the state to influence indigenous NGOs in the South. They can involve restrictive measures like investigation and coordination, deregistration or even closure or they can provide incentives like tax exemption status, access to policy makers and public funding (Hulme & Edwards 1997).

Conceptualizing institutional arrangement between NGOs, state, GRO/MBOs and donors

The role of NGOs in economic and social development cannot be understood without taking into account the nature of their relationship with other actors that participate in the non-governmental social development initiative. This paper identifies these actors as the developing country state, donors (including

NNGOs), NGOs (including SNGOs or GSOs) and GROs (including MBOs).

Figure 2 below shows the direction of the relationship between these actors and the kind of control or influence each of them can have on others. First, it should be recognized that though actors may work together, their objectives can vary and that one actor might dominate any particular bilateral relationship. The objective of each actor can either be categorized as some officially stated goal like poverty alleviation and national economic development or there can be some hidden agenda like access to foreign markets or simply to influence another actor through persuasion, financial inducement or direct coercion (Hulme & Edwards, 1997).

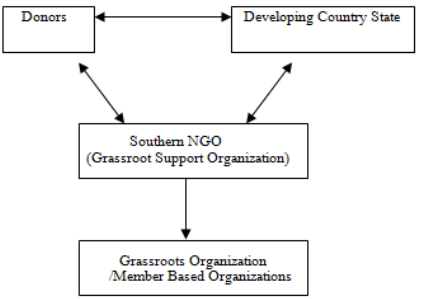


Figure 2. *Actors Relationships*

NGO and donors relationship

For example, in the case of the NGO-donors relationship, the donor's objective can vary according to its orientation. In the context of this paper, donors can be categorized into three groups: (a) private enterprises, (b) multilateral or bilateral aid agencies or foundations and (c) academic institutions. The objective of private enterprises can be to access the foreign market, whereas aid agencies and academic institutions would normally work for certain development goals identified in neo-liberal economics. They collude to participate in NGO activity in the developing country by providing finance, technical assistance (i.e., exchange visits) or other material resources irrespective of differentiation in their goals (Hulme & Edwards, 1997:7-8; Riddell & Robinson, 1995:67).

NGO and state relationship

Here, donor initiatives force developing country states to participate in an NGO activity to ensure state legitimacy is not weakened. According to Farrington & Bebbington (1993), if anything, State and NGOs are 'reluctant partners'. This seems to be the case in many countries, but in many instances the relationships

are more complex and prone to extreme variations. For example, Bratton (1989) argues that African States have generally adopted a control-oriented approach towards NGOs. In Kenya, the State is more concerned with larger NGOs present in cities and undertaking urban programs whereas smaller NGOs working in remoter rural areas and are allowed to operate with a much higher degree of 'autonomy' as they do not threaten the state (Anangwe, 1995). Though in some other countries the state appears to be more flexible, this flexibility is due to the preferences of specific regimes (Perera & Wanigaratne cited by Hulme & Edwards 1997). So, State and NGO relationships are case sensitive and call for a more detailed case study analysis to understand how states envisage different NGOs.

NGO and GRO/MBO relationship

The basis of the NGO and GRO relationship comes with the choices NGOs face in project implementation. It is up to the NGO whether it wants to involve itself directly with individual households or to channel its programs through GROs, which make up for more efficient links to the poor. In the case of SNGOs in particular, the choice of GRO root matters more as historically their most preferred operational mode has been mobilizing community-based organizations (CBO) according to a standard format, which these SNGOs believe it optimal because "it facilitates mass outreach and helps reduce administrative costs" (Hulme & Edwards, 1997:15).

However, irrespective of their operational preferences for optimal outcomes, Hashemi (1995) believes that the only way for NGOs to be more relevant to the poor is if they become accountable to those for whose welfare they are working. This is quite contrasting with the general practice where NGOs are seen to be more accountable to their donors or for that matter, the state. In short, to be efficient, "NGOs have to make a choice; between the four wheel drive vehicle that comes with government licensing and donor funding, and the much harder conditions involved in living along side poor people" (Hashemi 1995, quoted by Hulme & Edwards, 1997:15). To this effect, 'the question whether [NGOs or to this matter SNGOs or GSOs] are concentrating on their linkages to states and donors to such degree that their relationships with the poor are being eroded remains the most critical one'. This question will form the basis of our analysis in and the paper will discuss the case of the SNGO under investigation 'CRFSD', which is also involved with other actors creating an institutional interdependence.

Principal-agent theory: The research method

Today principal-agent theory has seen practical application in nearly every area of social science. It captures the dynamics of a relationship between two entities, two individuals or two parties where one is recognized as an agent because he/she is expected to perform certain duties identified by his/her principal who is bound to keep part of the commitment towards the agent (Halachmi, 2003). For example, in the developing world, institutions like non-governmental organizations (NGOs) can be agents of autonomous funding institutions like the World Bank or IMF or public funding agencies like government banks or they can be agents of multinationals donors. In short, an agent is employed to act on behalf of another called his principal, so that as a rule the principal him/herself becomes bound.

However, there is a caveat: According to Halachmi (2003), it is impossible to observe all actions and decisions of the agent or to infer them by observing the outcomes of agent's decision. This leads to a principal agent problem, which arises because of imperfect information constraints, either concerning what action the agent has undertaken or should undertake (Stiglitz, 1998).

Principal agent problems: Moral hazard and adverse selection

It is customary to distinguish two types of informational constraints in principal-agent theory: moral hazard and adverse selection. Moral hazard refers to endogenous variables that are not observed by the principal. Stiglitz (1998) defines moral hazard crudely through credit relationships between lenders and borrowers. According to him, in credit relationships moral hazard arises when the actions of the borrower can affect the probability of default. Laffont and Tirole explain moral hazard as discretionary actions of actors (i.e., NGO) that affect the cost or quality of their project. These discretionary actions can be allocation of perks by the managers (hiring personnel to lighten their work loads, inattention to excessive inventories of inputs, etc), indulgence in activities that privilege their career potential over efficiency, purchase of materials and equipment at high prices are a few of the negative efforts arising from moral hazard. Adverse selection arises when an agent has more information about exogenous variables than the principal. In general adverse selection allows the agent to extract a rent from interaction with the principal even if his/her bargaining power is low. Laffont & Tirole (1993) explain that an actor (State, Donor or NGO) is faced by adverse selection when it is only known to the MBO or the community whether its cost for a given level of cost reducing activity is high or low. Since a regulator, who must ensure that the MBO supply certain services, must also guarantee that the MBO is willing to participate in

implementation and execution of the project (even if it faces intrinsically high costs), the MBO must enjoy non-negative rent even if the project they are working in is inefficient. This leads to the possibility of adverse selection as the MBO could lower its cost-reducing activity below the socially optimal level and produce at a high cost that would have been its cost has it been inefficient. This slack provides the MBO with more utility that it would have had, had it been inefficient, and hence with a strictly positive rent.

Setting the scene: An ICT experience in Costa Rica

LINCOS - A project description

As discussed earlier, a series of initiatives related to the application of ICTs has been initiated in Costa Rica with the idea of introducing the use of communication technologies and making them accessible to the majority of people. As a result, CRFSD (also known as Entebbe©) in partnership with Massachusetts Institute of Technology (MIT) and the Costa Rica Institute of Technology (ITCR) initiated the LINCOS program in 1998.

CRFSD was created as a non-profit organization, in 1993. Today, is mission is 'to promote the use of technology applications that enhance peoples' well-being, within a framework of Sustainable Development' (CRFSD, 2004). LINCOS is a project meant primarily for the poorest marginal urban communities and rural areas, which, according to CRFSD, are the main locations that do not have access to technology platforms and other basic technology infrastructures (LINCOS [Multimedia] 2000). The LINCOS project involves the installation of a services unit, which works as a telecenter[x] with multiple applications available to its target beneficiaries that are children, adults, small and medium size farmer's producers, local small business, medical patients among others, whereas in full operation LINCOS could service over 4,000 people per month. (LINCOS [Multimedia], 2000).

This LINCOS units' structural design consists of a used shipping container - disposed of by a shipping company - that is about 20 feet long and 9 feet wide with a canopy added on top to provide shade and water protection. It is modified with doors and windows and normally configured with six computer stations and a small 'laboratory' inside (see appendix B for drawings). According to CRFSD, this container box and its size were selected because of 'its convenience, security, and portability,' by minimizing the environmental impact and benefiting communities where it gets permanently installed (LINCOS, 2004). However, in 2003 CRFSD decided together with the Digital Nations Consortium[xi] to change their focus on containers by taking LINCOS to second-generation phase following a permanent evolution strategy whereby the

project services can be placed if the community so wants by using: a community center, school (not necessarily recyclable containers) in an effort to focus mainly on community and educational aspects (LINCOS, 2004).

Project dimensions

Currently, the LINCOS project is no longer a pilot project and has already been introduced in two Latin American countries (Costa Rica and the Dominican Republic) with a total number of 18 units working in different rural communities. For example, three units have been set up in three different rural locations of Costa Rica[xii], and the rest have been located since 2000 in 15 different rural communities of the Dominican Republic.

In the case of Costa Rica, LINCOS projects have been implemented through donor initiatives, while in Dominican Republic they have been implemented through the national government.

LINCOS units are capable of attending the needs of over 4,000 inhabitants per month,[xiii] providing them various services. The following table gives the average capacity of a LINCOS unit for the various services it offers, per week, per month and/or per year.

Table 3. *Capacity of one LINCOS unit*

Type of Service Offered	Quantity of People Attended/Unit		
	Per week	Per month	Per Year
Educational computers to girls and boys between the ages of 7 an 14	240	1008	12,096
Educational Information Systems for people 15 years old and older	174	731	8,772
Lab services use for Educational Information Systems	59	248	2,974
Information Window and community services	65	260	3,120
Soil and Water studies	--	20 *	240
Teleconferences	560 **	2352	28,224
Total per Unit	1.098	4,829	77,448

Note: * It is estimated that the service can be offered to five persons per week; ** There is a 40 persons capacity for the video conferences, twice a day, seven days a week
Source: Lincos web site. [Retrieved from].

The Table shows that a standard LINCOS unit makes available various ICT-oriented services (banking, trade, local agriculture information, etc) to an average of 1,739 inhabitants per month, including school students as well as adult population living in or near the community where the project is introduced.

On average, LINCOS can also perform 20 soil and water studies per month, which can be utilized for myriad of purposes, i.e., early disease detection and sickness control or better agricultural practices. Last but not least, LINCOS also contain a teleconference and entertainment component which generally serve a group of 40 people, twice a day, seven days a week. This enhances cultural levels, creates 'new' forms of entertainment and

help, giving the possibility of communicating with the world (CRFSD, 2004).

Steps and processes to deploy LINCOS units

Implementing this project, involves various steps that correspond to the execution of a LINCOS unit in a community. These steps and processes are the ones constructing the chain under analysis (see Figure 1, in Appendix A) and they are outlined as following in detail.

Step 1: *Introduction of the Project*

Process 1: Overall Assessment: LINCOS was the brainchild of CRFSD where the original objectives of the project were set up. When the idea was still on paper, CRFSD initiated contacts with donors and government officials of the participant countries where the project was to be implemented. National evaluation/surveys were undertaken to establish economic, social, technological, cultural educational and environmental conditions. At this stage, every community that might potentially participate in the project was identified.

Process 2: Community Assessment and Selection: This activity involved evaluation/surveys to identify the communities where the LINCOS units could be fully integrated. Each community that could benefit from the project needed to fulfill a range of requirements and responsibilities. Once these requirements were met, CRFSD together with Rochester University would proceed with the elaboration of the community assessment or Rapid Assessment Process[xiv] (RAP), carried out in participation with the different actors in the community, with the idea of creating a strategic and operative work plan for the project's implementation. Thus, "each community will have access to only those applications (refer to appendix C, for application details) that are seen feasible for them, enabling every LINCOS project to have its distinct features depending on the community requirement and CFRSD and its actor's assessment report" (LINCOSa [second-generation internal file] 2003).

Step 2: *Construction and Installation*

Process 3: LINCOS Unit Construction: As soon as the 'Assessment and Community Selection' takes place and the relevant social and economic studies are initiated, the construction of a LINCOS unit begins.

Process 4: Unit Transportation: Transportation will begin as soon as the first units are ready for shipping to their respective countries/regions. However, prior to transportation, there must be a guaranteed site selection that meets the criteria set in the original plans. Transportation includes packing and sea or land

transportation, unit arrival, local transportation to the sites, final deployment on the selected site and the final tests.

Process 5: Community Selection of Administrative Organization and Site Preparedness: Here, an "administrative" member based organization (MBO) needs to be selected for the execution of the project as well as the coordinators working in different LINCOS' applications by the community and the CRFSD with mutual consensus. This activity also involves the identification of sites where the units are to be installed for the selected communities. Besides this identification and preparation of the site, the construction of necessary infrastructure such as restroom facilities, telephone wiring and tap water among other activities are requested from the community.

Step 3: *Economic Sustainability*

Process 6: Financial assistance: At this stage, different entities interested in the project participate. Since ICT projects are costly, the main financial actor is generally the government. Nevertheless, operation and maintenance costs are generally covered by private actors including companies, foundations and others (see tables 3.3 and 3.4 for costs information).

Step 4: *Training, Assimilation and Use*

Process 7: Training: This process is done after Step 3 has been accomplished. Here the CRFSD provides training to all the LINCOS' coordinators involved in different ICT applications.

Process 8: Assimilation and use of LINCOS units: Once the previous steps are completed, LINCOS is put into operation by making use of the different available applications chosen according to community needs.

Step 5: *Monitoring aspects*

Process 9: Monitoring and Evaluation: Regular evaluations are performed to ensure objectives of the project match with the identified needs of the community. This facilitates better control over those activities that take place along the project's operation.

Required resources for project implementation

As the financial process indicates, financial assistance must be requested to cover the required costs in order to implement the project. Table 4 provides an estimation of the base costs of LINCOS (initial fixed costs involved in the execution of a standard LINCOS unit).

Table 4. *Base LINCOS costs*

Item	Costs ($)
Unit construction	20 000
Cost of technologies (an average of 35 technologies such as equipment, labs, computer programs, material, etc)	25 000-60 000
Cost of the preliminary studies (RAP for the communities)	5000
Cost of training process (average of 6 one-month courses for 20 people)	20 000-50 000
Cost of the unit transportation to the site and customs duties	5000
Cost of installation	7000
Approximate total cost	82.000 to 150.000

Source: LINCOS project site [Retrieved from].

According to table 3.3, the base cost to execute a LINCOS project, on average, ranges from $82 000 to $150 000, depending mainly on the number of units installed, the location of these units, transportation,[xv] lodging and training of the program's technicians, equipment and, most importantly, the number of applications involved (see Table 7, Appendix C).

In addition, there are some operational (variable) costs that must be considered. The most prominent operational costs are land rent/buy to install the unit, power supply costs, internet access, and unit coordinators' salaries (see Table 5 for one unit costs).

Table 5. *Other Operational Costs*

Item	Costs ($)
Personnel in charge of LINCOS unit	13,100
LINCOS Operator	4,800
Assistant for laboratory and video Conference	2,400
Assistant for heath, environment and Information	2,400
Technician	3,500
Publicity	3,500
Land cost	20,000
Operative Cost	3,100
Light	420
Water	240
Telephone	480
Internet	3,600
Supplies	420
Gardens	300
Maintenance	600
Other maintenance costs	240
Visitors	900
Transportation	900
Unexpected 5%	2,235
Total	46,935

Source: CRFSD 2000 [internal file - estimation for one community].

Because of the high costs involved, CRFSD has mobilized various national and international actors to finance each LINCOS project. There are academic alliances such as those with the Media Lab at the Massachusetts Institute of Technology (MIT), Rochester School of Medicine's Center for Future Health, the Harvard Center for International Development, INCAE, *Universidad de Costa Rica* -the University of Costa Rica-, *Universidad Nacional de Costa Rica* -the National University of Costa Rica and *theInstituto Tecnológico de Costa Rica* -Costa Rican Institute of Technology (ITCR)- among others. In addition, there is also the contribution of

different national and international companies and corporations, which form part of the project's strategic partners. To identify some of them, we can mention the Hewlett Packard Corp., Microsoft Corporation, Alcatel, Motorola Co. and *Banco Nacional de Costa Rica* –National Bank of Costa Rica-. There is also assistance from the national government as which is an important actor and provides the physical infrastructure that a community requires for the implementation of technologies. Lastly, the contributions of some international foundations as the Discovery Channel Global Education Fund, the Rockefeller Foundation, the Costa Rica – United States of America (CR-USA) Foundation for cooperation, the AVINA Foundation and the Flora Family Foundation are part of this project (LINCOS, 2004).

These actors/project-supporters participate in different ways and their contributions depend mainly on the type of application that the project is introducing. It should also be noted that not all the actors mentioned above are necessarily involved in a particular LINCOS project and that a donor contributing in one community or specific country may not be part of another.

Selecting the main actors from the project

The participation of actors depends on the specificities of each step and the processes required by those steps. Although every actor plays an important role, in this paper we concentrate on those who have either provided significant academic assistance or a substantial financial contribution to the project and can significantly influence in some way the course of the project.

To justify the selection of certain actors from the project, an evaluation of their contributions to LINCOS is presented below. First, a summary of these actors participating in each step (refer to steps and process in section 2) is provided in Table 6.

Table 6. *Primary Actors*[xvi]

Steps	Actors Involved	Contributions: In-kind; Financial
1. Introduction of the Project	Center for Future Health at Rochester University and MIT.	Rochester University: RAP designs and faculty advisory for this component. MIT: Development and use of Constructionist Methodology[xvii]. Participation of master and PhD level students in the development of applications/technologies for communities.
2. Construction and Installation	MIT, ITCR	MIT and ITCR with canopy designs and container' platforms construction. Computer (hardware/software) selection / approval.
3. Economic Sustainability	CR-USA, BNCR, Discovery and State	CR-USA: Financial assistance for computers' acquisition and others devices for the introduction of the first LINCOS second-generation concept in Rio Frío community. BNCR: Funds requested for services' provision. Discovery Channel: Videos provision subsidies. State: Dominican Republic Government provided the funds for their 18 LINCOS units.
4. Training, Assimilation and Use	INCAE	INCAE: Together with CRFSD, training courses.
5. Monitoring aspects	INCAE	INCAE: Impact evaluations and business trainings.

Source: Author' own construction by using the information presented in reports, Internet and other related sources to the project.

Donors descriptions

After above selection, a description of the main donors is offered to give a better idea of their objectives or mission.

From academic Institutions:

The Technological Institute of Costa Rica (ITCR): ITCR is a Costa Rican public institution of higher education in technology. It was established in 1971, becoming the first technological university in Central America. Its mission is 'to launch strategic actions to consolidate its national and regional leadership in the fields of technological education, innovation policies, and transfer of technology focusing on productive sectors, regional projection, and potential international cooperation' (ITCR 2004). ITCR became LINCOS strategic 'partner' a few months later after the CRFSD initiated the idea in 1998.

*The Central America Institute of Business Administration (INCAE):*In 1964, the business community and the governments of the Central America founded INCAE. It is a private, non-profit, multinational, higher education organization devoted to teaching and research endeavors in the fields of business and economics aimed at training and instructing from a worldwide perspective. Its mission is 'to actively promote the comprehensive development of the countries served, enhancing leadership skills within the key sector by improving management practices, attitudes, and values' (INCAE, 2004).INCAE has been working with LINCOS since 2000 by given technical and monitoring assistance. Thus, INCAE provides in-kind services to CRFSD instead of providing direct financial assistance. For example, master and doctoral students

from INCAE come to CRFSD installations to carry out evaluations that in most cases are part of their research papers.

*The Media Laboratory at the Massachusetts Institute of Technology (MIT):*The MIT Media Lab is both an academic department and a research laboratory and operations started in 1985. The research program is funded by over 300 of the world's largest companies, with a total volume of almost $30 million per year (LINCOSc 2003 [internal file]). The focus of this research has historically been human-machine systems, and now explicitly includes a strong research agenda for sustainable development. The Media Lab is a 'co-founder' of the LINCOS project.

*The Center for Future Health at the Rochester University:*The center for future health is a collaborative effort of the School of Medicine at the University of Rochester and the MIT Media laboratory (Rochester University, 2004). It is dedicated to the creation of a system of intelligent devices that can be used worldwide and will enable people to monitor changes in their own health and compensate for physical limitations. The center conducts research in a problem-centered and interdisciplinary way in order to achieve personal health technology goals. The idea is that this allows progress to be made in areas where solutions require such disparate expertise that standard research approaches fail. Its objective is 'to provide a platform of inter-operability on which to develop a large array of health devices for personal use, permitting their clinical testing and then allowing rapid transfer to industry' (Rochester 2004). The center has joined the LINCOS project in collaboration with the University of Rochester and MIT since year 1999, one year after the project started.

From Companies/Corporations

*The National Bank of Costa Rica:*As a public bank, its mission is 'to become the country's financial *partner* by provision of secure and excellent services' (BNCR, 2004). The bank emphasizes activities where it has a clear competitive advantage. BNCR was 'invited' to become a donor of LINCOS by helping with their funds to meet its operational costs in LINCOS, San Marcos de Tarrazú. This contribution was to be mainly for the implementation of Discovery Channel videos.

From International Cooperation Agencies/Foundations

Discovery Channel Global Education Partnership: Discovery channel recently –April, 2004- changed its name replacing "foundation" with "partnership", thus becoming Discovery Channel Global Education Partnership (DCGEP). According to them, 'the latter word more accurately states the nature of the organization' (Discovery Channel, 2004).This is a non governmental organization, a public, non-profit entity that works

with partners and donors to bring to scale a grassroots education project in order to make positive difference in under-served communities around the world (ibid).

DCGEP is dedicated "to reaching across the global information divide with the tools and training necessary to extend the power of ICTs to under-resourced communities around the world".Its goal is "to bring empowering benefits of technology to 1 million children and their communities by the end of 2005" (ibid.). Currently, DCGEP participation with LINCOS -in some communities- is about providing videos support.

The Costa Rica-United States of America Foundation (CR-USA): CR-USA is an innovative bi-national mechanism for international cooperation established in 1996 and based in Costs Rica. It is a private, non-profit and independent organization that manages an endowment of $56 million US dollar, whose purpose is to promote cooperation between the two countries, within the framework of sustainable development by supporting projects in technical cooperation, technological transfer and capacity building. Its mission is 'to promote, encourage and develop the broadest cooperation in all fields of human activity between the peoples and government of Costa Rica and the United States of America, through the exchange of ideas, specialized assistance and technical support, to carry out and improve policies and programs that tend toward sustainable development and the mutual and general benefit of both countries' (CR-USA Report 2002:2). CR-USA directs its resources to private and government non-profit organizations whose goals are in agreement with CR-USA's requirements. According to CR-USA (2004), these organizations have to prove their contribution towards an improvement in the national population's social and individual way of life. CR-USA's ties with the CRFSD began in 2002, when they approved $106,618 funds for the establishment of a LINCOS second-generation unit in one rural community –Rio Frio de Sarapiquí - of the country.[xviii]

*Community MBO Description:*Besides the actors indicated above, the project also needs the participation of the local community for project integration. Each community will need to join together to form a local administration or MBO that directly and responsibly manages the project with the assistance of the coordinators from each LINCOS' application. This MBO and the applications' coordinators are represented in figure 3.

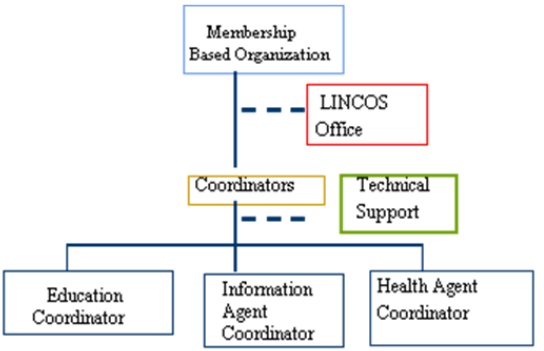


Figure 3. *LINCOS community MBO*

The MBO is the entity locally responsible for the personnel in charge of each LINCOS application. Their objective is to delegate functions to the coordinators and to control their performance. These coordinators are chosen by the MBO to meet the necessities of the community. They are supposed to be a small group (maximum 4) whose task is to guide the use of technology and to provide maintenance of the equipment.

In conclusion, there are requirements and responsibilities that need to be accomplished between the different actors and the CRFSD. This set of requirements and responsibilities might be creating personal ties between the actors involved. These interactions can be characterized by a basic set of principal-agent relationships existing between the actors. For instance, there is a relationship between the CRFSD and its donors; similarly there is a relationship between the CRFSD and the MBO. Here, each of them represents different objectives that can be influenced according to the different relations of power exercised by each of them (it can be seen in terms of financial resources or in-kind assistance).

In the next section such relationships will be identified, analyzed and highlighted. The discussion will underscore how some these actors -across the different sectors (private enterprises, academic institutions, NGOs and State)- are interconnected, related to each other, or working together - be it structurally, through an individual, or through other common links.

Analysing Instititutional Arrangements

"Principal-agent problem arises whenever one individual's activities have an effect on other individual. The question arises under what circumstances do these interdependencies arise?"
(Nobel Laureate Joseph Stiglitz 1998: 967)

In this section an attempt is made to analyze the institutional arrangement of the LINCOS project, while taking account of the different steps and processes involved. Each process and step corresponds to a bilateral or multilateral relationship between various actors, which creates the circumstances for the principal-agent problems for LINCOS project.

NGO – donor relationship

This section will cover those steps and processes (i.e., introduction of the project; economic sustainability; and monitoring) that correspond to the NGO- Donors relationship. (See Figure 1, Appendix A, for the framework of the institutional arrangement).

Step 1: Introduction of the Project.

The NNGO and SNGO Relationship and Adverse Selection: Staff of LINCOS and Rochester University in collaboration with the community performs the RAP. However in this step, community participation is generally in the form of basic provision of any required information to Rochester to do the assessment (income, work activities etc). There is no active participation in the sense that the community is involved with project objectives. They only become involved when the LINCOS container is in place and/or setup in the assigned area. Then, the community helps with the installation, land cleaning and construction of the required infrastructure such as toilets and storerooms. This implies that community involvement is for public works only and it does not directly take part in the RAP process itself. Late involvement of the community exposes the LINCOS project to problems that arise from adverse selection.

Another relevant issue is the time framework assigned for the community assessment before the project is implemented. This consists of 5 days where visits to 2-3 communities is necessary, and then an extra 2-3 weeks are used by Rochester personnel in their home country (the United States) to write up their findings. Afterwards, one member usually comes to Costa Rica to presents the results (Soruco, 2002b). Since the assessment results lead to the selection of communities and applications introduced by the

project it should ideally represent community preferences through active community participation so that any community specific factors (heterogeneity, differences in age groups, gender sensitivity and cultural aspects) are taken into consideration. However, 5 days to visit 2-3 communities is definitely not enough time to be able to take into account complete indigenous characteristics of each community and to understand their needs. Furthermore, since Rochester is a medical institution, its emphasis is on health aspects (see chapter III, page 33 for details on Rochester University). This gives rise to case specific constraints about community assessments and the way they are performed. This particular issue has been realized by CRFSD, which concluded that "Rochester's assistance by performing RAPs is over-emphasized in health aspects and other important elements from the community generally being ignored" (CRFSDa [internal file] 2002). However, this implication/ recommendation has still not lead CFRSD or Rochester to change their methodology for RAP assessment and they are still performed in a similar manner to that explained above. This assessment procedure increases the risk of 'adverse selection' and is a clear constraint since there is not enough time to accomplish the project-desired outcomes where… "each community will have access to only those applications that are seen feasible for them, enabling every LINCOS project to have its distinct features depending on the community requirement" (extracted from chapter III, page 27).

*Personal Interests:*Here the question arises as to why, in the first place, community assessments are performed by Rochester which is primarily a medical university and why the time frame for the field survey is a mere five days? After looking at different scenarios, a possible answer is that there are personal links between CFRSD and Rochester. Alex Petland (director of the Media Lab at MIT) and co- founder of the LINCOS project took on board Rochester Center for Future Health because he is also its co-founder, which meant that it became CRFSD's new 'partner' after its inception. This contradicts the official line of CFRSD apropos LINCOS and its donor selection. According to Dr. Juan Barrios Arce (CRFSD executive director), the most important point in the case of LINCOS is to find out where and how the project will be implemented in a manner that it…"*helps to understand the community needs, therefore implementation costs to than, start looking for the right donors"* (email, June16th, 2004). However, it seems that some actors are chosen not because they are relevant to the project but because of personal links, thus '*becoming contractors' agents instead of independent actors… in need of resources* (chapter II, page 14). This arrangement between actors

fails to reflect the needs of communities, by making LINCOS more '*accountable to its donors than its beneficiaries'* (Thomas and Allen, chapter II, page 15).

Secondly, this five days time could be to reduce costs, since the project has to pay Rochester personnel for the duration of their field visits to the community. A shorter time in the field means lower costs. Any such costs are not likely to be covered by donors other than Rochester or CFRSD itself because Rochester personnel generally charge high prices for their field visits (see chapter III, table 3.3 for details). In other words, the time span of 5 days does not reflect the time period required to analyze and assess community needs but budget constraints faced by the project. Thus, this time limitations can also reflect reasons for communities' failures (there are illustrative examples that can reveal some of this failures and they will be addressed in later sections). A proper time framework should be arranged: each community needs different periods of time since they are heterogeneous and culture shocks and changes will influence project results.

Step 4: Economic Sustainability

In this step, the paper identifies certain factors affecting the economic sustainability of the project.

Time Constraints: As discussed earlier, CRFSD presents itself as an entity that 'does not provide funds/ subsidies to communities interested in the project. Instead it works as an intermediary actor providing information about potential donors or by handing over community financial requests to identified donors (i.e., GSOs). However, the funds requested from donors (by the community or through CRFSD itself) are asked for a period of 1-2 years. CRFSD sees this as the time necessary for the project to take off - for communities to begin project ownership and for it to become financially self-sustaining-.

However, there is evidence to suggest that this is not sufficient for a LINCOS project to become self-sustainable. One example is the case of San Marcos community where a LINCOS project started in 1999 - more than four years ago- and they are still having problems with both fixed and variables costs (see the base costs in table 3.3 from chapter III) that the community was expected to have begum covering two years ago. Some LINCOS MBO members of the community have had to take care of some of them by using their own personal financial resources. For example, *Don* Rodrigo Jimenez Roble (community leader and member of the LINCOS MBO) had on several occasions paid the salaries of the LINCOS community coordinators.[xix]

What this reflects is that LINCOS sell-services failed to cover many of the expected costs from the project. CRFSD provided one million colones financial assistance to help with these costs and to pay back the debt acquired so far with Mr. Jimenez. However, CRFSD simultaneously pointed out that they are generally not responsible for the bail out and they are also not responsible if the project has failed to sell their services (CRFSD [letter sent by CRFSD to Mr. Jimenez Company (Coopesantos) June 2003). This shows that on the one hand CRFSD wants to put pressure on the community that they should not depend on it but make the project self sustaining, and on the other hand it recognizes that the project has yet to realize its objectives and is still dependent on external finance to sustain itself. Additionally, any provision of funds is also in contradiction to CRFSD's own commitments to the project as it clearly advocates that it does not financially sponsor any LINCOS units, but instead only assists by redirecting community applications to appropriate financing sources (LINCOS, 2004).

Here the point which arises is why there is a time limit of at most two years for the financing of a LINCOS project? One probable answer is that donors often give funds for short-periods since in the long run they expect the project to be sustainable (from chapter II. page 19). This is the case with the LINCOS project. However, a two years time limit for it to become self-sustainable by charging for its services is unrealistic and not practical since the project is usually targeting one of the poorest communities in poorest marginal and rural areas who generally cannot afford to finance any social services. For example, on average, the most common cause for non-attendance for the population in rural Costa Rica is that they simply cannot pay for it (see graph 1, chapter I). Such communities need more time than 2 years to become sufficiently developed to be able to pay for the services offered to them. Since the commitment of any donor is not more than 2 years towards LINCOS project, it appears that LINCOS is facing sustainability problems, whereas in reality it is the time limit of 2 years by CRSFD, which is unfair and unrealistic.

*Personal Interests and Moral Hazard:*CRFSD has also involved actors who have no direct link with the LINCOS project *per se*, such that the association between these actors is independent of LINCOS objectives. For example, Discovery Channel has been providing videos made by Discovery about various geographical phenomenon (i.e., volcanoes) to improve general awareness among the public. However, Discovery has charged CRFSD for the provision of these videos, which is financed by involving another actor BNCR (the National Bank of Costa Rica). This is a NNGO-SNGO relationship. According to Juan Barrios, the reason

Discovery and CRFSD got involved with each other was because they were both interested in the branding of their respective products (Email: September 2004). On the one hand, Discovery is being branded in Costa Rica as providing its documentary videos to LINCOS projects, and CRFSD is being branded internationally by getting an international media actor on board. Hulme and Edwards work (1997) in chapter II states that such relationships between actors are about "accessing 'foreign markets' and would make a perfect case for moral hazard as far as LINCOS project is concerned.

To know whether the personal interests between CRFSD and Discovery have led to moral hazard, let us see if LINCOS has anything to gain from this arrangement. The answer is 'not much', as Discovery is charging on average amount of $14,000 for 2 years' video provisions to a single-community and the theme of most of these videos is not relevant to those communities. For this video provision payment, CRFSD has asked for funds from other partners –BNCR-. When CRFSD asked BNCR to become a partner by financing Discovery assistance, some issues were accorded. According to the contract agreement, if BNCR joins the project by financing these videos, it will benefit from the relationship by getting the approval not only to name Discovery as one of its partners but also by showing the development assistance they have provided to a community. If they want it, BNCR will also have a designed link to their site in the Discovery web page. These are incentives provided by Discovery through CRFSD. These relationships (CRFSD and BNCR) also include monthly project reports being sent to BNCR by CRFSD.

Here one can clearly see that the interests of the actors involved are not associated with the LINCOS project objectives, and that these various actors carry their own agendas. In this scenario, the sustainability of a LINCOS project and its effectiveness towards the development and welfare of community can easily be questioned.

The NNGO - SNGO Relationship and Moral Hazard: There is another issue that is worth analyzing here, and that is the case of the 'new' LINCOS approach, since it changed to LINCOS second generation. As already noted in chapter III, this approach was initiated in 2002, with the idea of introducing the latest technologies in the LINCOS units. This 'new' phase consists of putting together different perceptions from the project and changes in the applications provided by LINCOS, by making use of the attained insights from previous experiences. Moreover, its focus is now more on the 'Communities' Sustainable Development, leaving apart the 'old' concept of 'Hardware'- just computers or

technology *per se*- by concentrating on people and their problems while promoting Sustainable Development' (Chapter III pages 24-25). LINCOS second generation, as CRFSD' executive director Dr. Juan Barrios Arce defines it, *'became a project that can now be placed according to communities' request by using: a community center, school and not necessarily the recyclable containers [as original idea was about] in an effort to focus mainly on community and educational aspects* (extracted from chapter III, page 25)making LINCOS suitable for every community's needs.

The LINCOS second-generation idea started by 'bringing' the project to the Rio Frío community, where funds used for this initiative were asked and provided by the CR-USA Foundation. Looking closely at the Rio Frio LINCOS project, it seems that one of the important reasons for switching to LINCOS second-generation while focusing it on sustainable development of communities is that CRFSD wants to fall in the CR-USA's general agenda.[xx] CR-USA is the only financial donor for the first ever second generation LINCOS project. For example, according to Juan Barrios, sustainable development is now an issue that needs to be part of every LINCOS. As he states in his own words *"LINCOS Rio Frio became the first second-generation unit, where the telecenter concept moved apart, putting 100% emphasis on human sustainable development*" (email, June 6th, 2004).

Notwithstanding this rhetoric, in reality, LINCOS project in Rio Frio fails to incorporate the changes which were pre-requisite for a standard second-generation LINCOS project. Whereas in the first place these changes were brought into the proposed second generation LINCOS model to align LINCOS with the objectives of CR-USA's.For example, the model second generation LINCOS proposes options other than the 'containers' since they require high operational costs to be incurred by the community and have thus been identified as a major constraint on sustainable development among communities.

The second generation LINCOS proposes public buildings instead of containers. These community buildings can be schools, community centers etc. However, it has been noted that containers are still being used in second-generation projects even where there is access to public buildings. For example, the Rio Frio community has recently received a second-generation LINCOS project in container form despite the fact that it has several public buildings available (i.e., 7 pre-schools, 60 schools, 3 colleges and 1 special center) (CRFSD, [internal file on regions information] 2003).

So the question arises as to why CRFSD still prefers to install containers instead of utilizing public facilities despite high costs that are associated with them. According to CRFSD "*this container*

box and its size were selected because of its convenience, security, and portability… by minimizing the environmental impact and benefiting communities where it gets permanently installed" (extracted from chapter III, page 25).

Notwithstanding the CFRSD official justification for installing containers, the real justification might lie somewhere else. It has been observed that CRFSD' general director and founder, Jose Maria Figueres Olsen (a former Costa Rican president) is the owner of the used containers in this project. During Mr. Figueres administration (1994-1998), Costa Rica faced an important change in the way its major export commodity (bananas) was transported. Earlier, bananas had been transported by train, whereas now they are transported in large containers through trailers. Mr. Figures' family is among few who were the owners of some of the companies that are given this new transport services, not just nationally in the country but to different countries in Latin America (Dunkerley, 1998: 589-655). Today, Jose Maria Figueres is also the owner of a shipping company called *Melones de Entebbe* - Entebbe Watermelons Co.- that exports melons to outside Costa Rica by also using these trailers (CRFSD [internal file] 2000). This example provides a good explanation why containers are used in LINCOS and in LINCOS second-generation despite the fact that it is costly. And besides, the CRSFD claim that containers are environmentally friendly can easily be denied as the alternatives appear better options environmentally and economically: they are cheaper and it is environmentally more effective to utilize vacant public buildings than to bring and install a container.

So now the question arises as to whether the claims by CRFSD to put emphasis on sustainable development in second generation LINCOS was only to justify the funds channeled from CR-USA. Another question is why CR-USA has failed to notice this deliberate violation of project objectives by CRFSD in implementing second-generation LINCOS project at Rio Frio. Both these questions suggest that the relationship between CFRSD and CR-USA might have suffered from moral hazard.

To unpack these questions, the paper investigates whether there are hidden interests among the actors involved. The founding trustee of CR-USA for Costa Rica, is *Lic.* Carmen Maria Valverde Acosta who has a close relationship with Jose Maria Figueres. Ms. Valverde was a member of the Costa Rican Legislative Assembly during Jose Maria Figueres administration (1994-1998) and also served as its Legislative Assembly vice president from 1995-1996. At the time that this study took place, she was not only the president of the Foundation namely 'the Cultural and Historical Center' created by the father of José Maria Figueres but also a

member of the Board of Directors of the CRFSD-LINCOS project. Additionally she, along with Jose Maria Figueres, has been a consultant on new ICTs (La Nación, 2004).Such relations between the main actors of CRFSD and CR-USA have evidently led to moral hazard.

Step 6: Monitoring and Evaluation

In this step, the prominent actor is INCAE with their in-kind contributions to LINCOS. INCAE provides its 'assistance' to LINCOS by supplying students that come to perform monitoring and evaluations from the project.

*Personal Interests and Adverse Selection:*Here, both CRFSD and INCAE can be seen as agents that are benefiting from what could be called ´mutual alliances´: CRFSD gets INCAE students as interns who work for LINCOS, and INCAE is assured of a place where students can perform their research. However, one has to ask if the 'partnership' between CRFSD and INCAE is relevant for LINCOS.

The interns from INCAE are primarily responsible for working out various proposals advising LINCOS on how to get donors (Soruco 2002a, 2002b, 2002c). As a result, CRFSD has several proposals for each LINCOS project where each proposal tries to target a certain donor by focusing on its specific area of interest. For example, any LINCOS proposal for CR-USA would highlight the issue of sustainable development because CR-USA works mainly in that area. In short, when INCAE representatives are presenting CRFSD with different proposals, they are more interested on 'matching' donors' objectives than those of the LINCOS project, thus creating the situation mentioned by Thomas and Allen that '*NGOs are in practice more accountable to their donors than they are to the beneficiaries"* (chapter II, page 17). This evidently creates a problem of adverse selection. I will now discuss how the INCAE and CRFSD arrangement has made the LINCOS project prone to adverse selection.

INCAE is a well-known Costa Rican academic institution that became part of the Digital Nations Consortium of the Media Lab from MIT. INCAE major interest in LINCOS is about knowing the impact that this project has on communities. INCAE started an analysis in San Marcos Community with the assistance of Angela Casper, who is an INCAE business administration master student. This evaluation involved a one-month (June, 2002) community assessment. This evaluation is now used as a standard model of the LINCOS project called *Historias Existosas* (Successful Histories), and is attached to most proposals to target donors, showing them community impacts of a standard LINCOS project (Soruco 2002a). However, I have screened this evaluation report and it turns out

that it contacted only 3 people from San Marcos community, which include a woman, a child and a member of the LINCOS community MBO - Rodrigo Jimenez - (CRFSD [file from INCAE] 2002).

Today, CRFSD is using this evaluation report and assumes it is applicable for all LINCOS communities (Soruco 2002a). This is in clear contrast with their claim that communities are unique entities, putting the success of any future LINCOS project at risk as any community selection and LINCOS project implementation based on this evaluation report would be prone to adverse selection. It is also important to mention here that, what might be seen as 'mutual alliance' between CRFSD and INCAE, is actually turning out to be a source of problems with the final project objectives. For example, for 2001, the total number of internships was 40, and in 2000 it was 60 (CRFSD, [internal file LINCOS second generation] 2003), which was a huge number and as Heeks & Baark suggest it may well be that 'too many staff will have objectives that are too broad and shallow' (Chapter II, page 15).

NGO - MBO relationship

In the CRFSD–MBO relationship (see appendix A, Figure 1), an administrative structure for the project is used. This is going to be analyzed by breaking up the chain to look at the CRFSD-MBO relationship. For this purpose, the respective steps of the LINCOS project will be analyzed.

Step 4: Training, Assimilation and Use

The NGO – MBO Relationship and Adverse Selection: This step tends to involve cultural factors as major forces that can slow down a project impact if they are not taken into account. Therefore, communities can be facing (or going through) a process of adaptation that is different in every community, which sometimes takes longer periods to assimilate the uses of the project.

To exemplify some of the cultural problems faced by communities, one can start by looking at the case of Dominican Republic where people complain about facing problems in understanding how the LINCOS project can affect their lives. To this effect, the following email conversation is relevant. This took place between the CRFSD' educational coordinator (Costa Rica) and the local personnel from LINCOS- Seibo (Dominican Republic).

lincos _seibo (Tue Jul 24 13:31:43 2001):

lincos _seibo: *le decia que cuando llego el formulario, parecia que era un documento de una direccion equivocada.*[What I was telling you was that when the documentation from LINCOS Costa

Rica came, it was like coming to a wrong direction...meaning, not one knew what to do with it]

lincos _educacion: por qué [why, what do you mean?]

lincos _seibo: *a lo que me refiero es que hay un problema educativo tan tan grande aqui, que los muchachos reciben (en este caso los mediadores) una capacitacion, pero en realidad para ellos eso es bla bla (le termino la idea?).* [Here, we have a very serious cultural problem in relation with educational aspects. People (meaning LINCOS personnel in Seibo-Dominican Republic) are receiving training that they perceive as useless, because nothing is making sense, it is like someone talking a different language… Do you know what I mean? Should I say more?]

lincos _seibo: *es un producto de la educacion dominicana en las escuelas. Las teorias, es algo que no se le presta interes* [It is a result of the Dominican education system…theories, concepts are things that one does not pay attention to and this training is perceived like that] ...

lincos _seibo*: ud aqui tiene gente en un auditorio, que le estan diciendo que si, que entienden, lo que ud le esta explicando... y ud jamas se enterara que la importancia y atencion que tienen para ud es minima.*

[Here, you have people that say yes to everything, making you think they understand what you are saying… Never letting you know that attention and care for this things are minimum]...

lincos _seibo: *la cultura en su totalidad esta en otro rumbo...se necesita otro enfoque.* [Here, because of cultural factors, we are going opposition different directions... meaning, people are not sharing the same interests in the project… There is need for another approach... meaning; we should work this in a different way...]

The email conversation indicates the problems communities face, when such aspects are not taken into account. Similarly, when looking at the case of San Marcos LINCOS project, LINCOS personnel expressed their feelings about the irrelevance of services and the poor quality of the project. This was the case with some of the health and environment applications that were not in use at all, since the community did not know how to use them and did not consider them useful tools for their daily file. The community at San Marcos also felt that they have been asked for too much by the LINCOS project and they were not prepared to deal with it and felt overwhelmed. Additionally, another problem that can make the case for adverse selection in the San Marcos project and that ought to be mentioned here is that in that particular project, LINCOS' MBO meetings were few and when they took place, not all members were present, reflecting not much interest in the project

by the community. This lack of interest made it difficult to propose solutions to overcome some problems such as the lack of money to pay LINCOS coordinators salaries - and there is evidence that salary problems generated other problems -. For example, local LINCOS coordinators were not performing their duties efficiently, which further exacerbated coordination problems among the personnel. Furthermore, in the absence of salary payments, coordinators felt no obligation to do their job or to act in response to any required task. This behavior fits Riddell and Robinson's work (chapter II), which suggests that 'well-trained field staff, motivated by a reasonable level of remunerationand committed to the goals of the organization, clearly play a critical role in successful interventions… Poorly paid staff have cause to be less committed to the projects they are managing or executing, and will be tempted to spend more project time engaged in moonlighting activities' (extracted from chapter II p. 15). [evidence is not supporting the analysis].

c) *Technological Constraints:* Another problem is with the products and applications that LINCOS projects offer or introduce in communities. For example, in the case of Cutris Community, there were problems with Internet signals (either no signal at all or when available it was only for short periods. This was in most cases the reason for LINCOS services to be stopped. Sale of inputs, which rely on this application, was in many cases impossible. In Cutris, those Internet problems also created an environment in which LINCOS personnel wanted to resign since they had nothing to do. In San Marcos, this situation was quite serious and some of the LINCOS coordinators actually left the project because of such hitches. This was a great loss for LINCOS and CRFSD since they were from the community, had already acquired substantial capabilities working on the project, and their loss appeared to have significantly affected project progress (CRFSD [internal file] 2000).

There were also problems in LINCOS projects in the Dominican Republic (Bohechio region) where containers were closed in the evenings, and remain closed on weekends, which made LINCOS units less accessible to their respective communities. Furthermore, a problem arose when LINCOS projects faced high costs because they had to buy electricity generators (which are both noisy and polluting) because of constant blackouts and power fluctuations in Dominican Republic (Shakeel, 2001). Therefore, high electricity costs also forced many LINCOS units to open only at daytime, thus excluding the working population who were usually free in the evening.

NGO - state Relationship

CRFSD executive Director, Dr. Juan Barrios points out in his own words for LINCOS project: "*the best donor is the government, because initial costs are too high and basic infrastructure should be provided by government… then different enterprise [players] can assist with some maintenance and operational costs"* (Email June 17th, 2004). But why then, is this not the case in Costa Rica. As indicated in chapter III, the LINCOS project only works with government support in the case of Dominican Republic.

Political Constraint and Moral Hazard: The reason the government is not involved with LINCOS initiatives in Costa Rica is because Jose Maria Figueres belongs to the political party (*Partido Liberacion Nacional*) that lost in the 1998 elections and the opposition party (*Unidad Social Cristiana*) has been governing the country since 1998-2002 and 2002-2006. As Farrington & Bebbington (1993) suggest, "if anything, State and NGOs are 'reluctant' partners" (chapter II, page 19), and the reluctance of the State to become a stakeholder in the initiative of the opposition is well justified.

Thus, despite believing that the Costa Rican government is the best donor for LINCOS, CRFSD had to look somewhere else for money (for example CR-USA in Rio Frio) and was forced to provide financial assistance itself as in the case of San Marcos, despite proclaiming not to do that.

The situation in Dominican Republic is different. There, 18 LINCOS units have been installed with the assistance of the government. In this case there are no RAP performances since the government is the one choosing where the LINCOS units will be placed (in which communities) without using the services of Rochester personnel. In the Dominican Republic, LINCOS is working in areas that, according to Hulme and Edwards, are already identified by the state as those where such initiatives work well, designed to help the state target poverty alleviation goals and national economic development (chapter II pp.18-19). LINCOS in Dominican Republic also fits the arrangement mentioned by Anangwe (1995) where a GRO is allowed to work with a high degree of independence without threatening the state. In other words, it appears that the involvement of state is important to avoid the circumstances, which generally lead to principal-agent problems in the case of LINCOS project.

Conclusions

The paper finds out that the collaboration of CRFSD and Rochester foundation has proven to be ineffective because (a) the Rochester personnel, who were called in to help select the

communities, face time constraint and suffer from unfamiliarity with the context even language problems (English instead of Spanish) (b) Rochester foundation, which has a health focus, is not equipped to carry out a RAP which can cover economic, social, technological, cultural, educational aspects of the project and could only focus on the health dimension. Thus any 'partnership' between CRFSD and Rochester is creating circumstances for adverse selection. Here the paper finds out that CRFSD and Rochester are partners because there are strong personal ties between the executive bodies of both organizations.

The paper also suggests that LINCOS is also exposed to exogenous factor, which hampers its objectives. For example, there is time limit of 2 years after which LINCOS project is expected to be sustainable. The already implemented LINCOS projects (i.e., San Marcos and Cutris) suggest that 2 years is not enough because generally it takes a lot more time for the community to develop and finally be able to pay for the services. However, this time limit has been the permanent feature of every LINCOS project because generally donors don't provide finance for long-term projects. This exposed LINCOS to the problem of moral hazard.

The paper also finds out that CRFSD itself has suffered from moral hazard as it was able to get CR-USA on board by switching the emphasis of LINCOS projects on sustainable development by initiating LINCOS second generation. However in reality, the LINCOS projects (i.e., Rio Frio) followed same old methodologies which were part of the original LINCOS despite having a choice to follow a more environment friendly options of LINCOS second generation. For example, the second generation LINCOS projects still use containers despite the recent emphasis on using public buildings. The paper investigates the reason behind using containers and found out that the General Director and founder of CRFSD owns these containers and thus he is still emphasizing on container use despite it being a costly option to the project.

Another relationship between the actors that has lead to moral hazard is of CRFSD and Discovery who have entered into a partnership to brand them selves. There partnership hasn't bring any good to LINCOS and if anything the costs of the project can risen up if CRFSD decides to buy Discovery videos for each LINCOS project which in many cases are irrelevant to the communities.

Moreover, the monitoring and evaluation stage of LINCOS project also create circumstances for principle-agent problems i.e., adverse selection. For example, the evaluation of LINCOS projects is done by INCAE under the supervision of CRFSD. However, it appears that both actors are partners out of convenience as CRFSD

places INCAE students as interns in its organization. To date INCAE has only done two community assessments on San Marcos and Cutris. For San Marcos, I had the access to the data, and it is found out that the community assessment is based on three people out of approximately 4000 people. Such community assessments are definitely not representatives of the community and tell little or virtually nothing about the success or failure of the project. Strangely enough, CRFSD claims that this evaluation report represents a standard LINCOS community and thus other LINCOS projects should be based on its recommendations. Clearly any such approach would expose LINCOS project to adverse selection. For example, a community member of LINCOS project working in Dominican Republic in Seibo has shown his dissatisfaction over LINCOS services and its relevance to the community needs. Similarly in Costa Rica the San Marcos and Cutris communities present the same level of dissatisfaction over LINCOS project as they considered many health and environmental services/ applications provided by the project as irrelevant. They claimed that they cannot relate to these services and are not equipped to utilize them. These examples clearly suggest that LINCOS project is exposed to adverse selection.

Furthermore, in Costa Rica the LINCOS project faced political constraint as the founder of CRFSD belongs to the opposition. This lead to the minimum participation by the current Costa Rican government in LINCOS projects which forced CRFSD to find out donors and partners in the private sector or from international market. This political constraint in the first place, exposed LINCOS projects to moral hazard as CRFSD looked for international donors i.e. Discovery case. Some technological constraints, which are inherent to developing countries, have further hampered the effectiveness of LINCOS projects.

Finally, the paper in detail identifies and investigates those circumstances, which lead to principle agent problems in LINCOS project. Here these circumstances risen due to time and technological constraints and personal interests/personal links between actors. Time and technological constraints are exogenous factors, which affects the intentions of the actors, whereas personal links and personal interests are somewhat endogenous to factors. In this scenario, the circumstances of principal agent problem doesn't rise because of one actor but it is rather an outcome of the bilateral relationship or multilateral relationships between the actors involved in an ICT project.

Well identification of these circumstances is an important step towards solving the principal agent problem, and making LINCOS project a more effective one. This paper takes this important step

and would be of great insight for any body who wants to understand what are the inherent problems faced by a LINCOS project and how to solve for them or how to avoid them in an effort to make it a project which in reality works for the sustainable development of its communities.

Notes

& Robinson, 2012

[i] Is a shorthand term used to describe the widening gap between those who have access to a computer and internet and those who do not (Microsoft Melinda Found, 2004).

[ii] There are different likes and dislikes for what an intermediary organization can be (Carroll, 1992:9) however, in the case of this paper, the meaning will be understand as those actors –whether or not with a sense of social commitment- providing some source of support by channeling resources.

[iii] Indicating ways of negotiations among actors. For studies of these soft factors such as negotiation behaviors, see Schechter1998 and Solomon 1999).

[iv] Within this donors' classification the paper will include: national and international foundations, private enterprises and academic institutions. Although, in this paper it is recognize the vast differences that prevail between bilateral organizations (northern foundations) and private enterprises, and between those and academic institutions. But, they all are included within this classification since they are assisting the project by providing funds or in-kind resources that can be measured in terms of financial support. Therefore, they become more aid agencies [donors] rather than partners [as some of them may be considered by CRFSD]. Lastly, for the analysis purpose, the State will be seen as a separate actor, not included within this donor's classification.

[v] The difference between state and government is well known, however for the present paper the two terms are used interchangeably. This CRFSD-State relationship is only about how it works when project involves the State directly by 'purchasing' the project idea.

[vi] See chapter II for detailed explanation of Principal-Agent theory.

[vii] "Providing a service is just the starting point in a chain of events that should ultimately end in an increase in the well-being of users" (Carroll, 1992:63) whereas this increase in the well-being can't only be attributed in terms of income.

[viii] "Accountability is understood as the degree to which members (or citizens) can hold their leaders (or politicians, bureaucrats etc) responsible for their actions" (Biekart, 1999:305). However, it is important to mention that this accountability debate depends merely on the definition given to NGOs (Biekart, 1999:38).

[ix] 'New Policy Agenda' is term coined by Robinson (1993) whose beliefs are based on neo-liberal economics and liberal democratic theory (Hulme & Edwards 1997).

[x] "The Telecentres consist of a physical infrastructure that allows the access to the information and communication services by connectivity" (Gómez *et al.,* quoted in There are different types of telecenters, one of those are the multipurpose ones as LINCOS, which can provide a wide range of applications (ranging from telephony to internet connectivity) for individual, social and economic development. It is important to acknowledge that according to CRFSD, LINCOS differs from telecenters in some aspects, but for the purpose of this paper LINCOS is going to be assessed as a telecenter to facilitate the understanding of its concept.

[xi] The Media Lab at the MIT created Digital Nations Consortium in October 18th, 2000.

[xii] - San Marcos de Tarrazú community (Southern Region-Rural), 2000.
-San Joaquín de Cutris, San Carlos (Northern Region- Rural), 2001.
-Río Frío (Atlantic Region –Rural), 2002.

[xiii] This capacity is set as a reference by CRFSD as result of LINCOS historical information in communities of similar size.

[xiv] It is afeasibility procedure for community assessments, implemented in LINCOS by Rochester University. According to Rochester, Rapid Assesment procedures are anthropologically based methods –ethnographic interviews, focus groups, and particular observations – which elicit descriptive information of a cultural context (LINCOSb [internal file] 1999).

[xv] There is also the case that units can be installed outside the home country as it has been done in Dominican Republic. Therefore, they get changed if units are installed locally or internationally.

[xvi] It is important to note that the classification of actors presented in this table was the reality at the time of writing this paper. It is possible that positions may have shifted from what they were in the past, or may change in the future, such that the actors may find they are misrepresented at a later time.

[xvii] Proposed by MIT and it suggests that users construct –with available computer tools- meaningful products and knowledge in order to guarantee log lasting effects in the learning process.

[xviii] The funds were 38,366,450 colones, which represents $106,617.81 (at the average exchange rate according to the Central Bank for the calendar 2002 -359.85 / US$1-). See CR-USA web site for details on this at www.CR-USA.org

[xix] In 2003, there was an accumulated debt by LINCOS MBO to Rodrigo Jimenez of around 1 to 1.5 million colones = $ 3000US (CRFSD [internal file-b] 2003].

[xx] CR-USA mayor focus is on sustainable development, which to them it is the *'only process capable of satisfying the needs of present and future generations without compromising the ability of future generations to satisfy theirs'* (CR-USA's Report 2002: 2) which consequently came also the approach used by CRFSD.

[xxi] Detailed explanation about these steps and its processes is giving in chapter III.

Appendices

Appendix A:

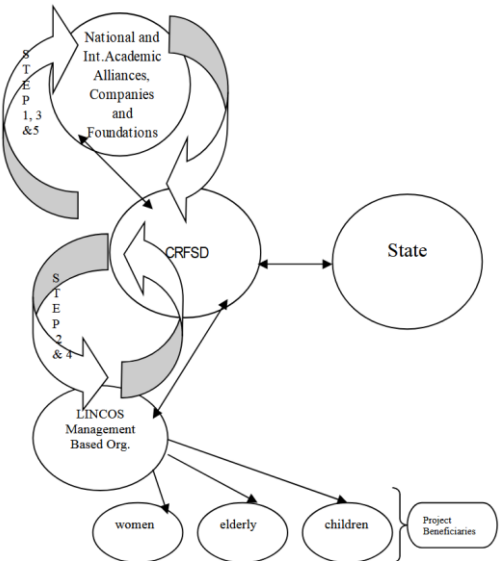


Figure 1: *Actors and Steps forming the Chain*

Source: Adapted by the author from the analysis "Stakeholders and aid flows in multiple aid chains" by Kees Biekart.

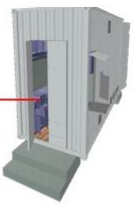
In short, the chain of this ICT project and its institutional arrangement involves *different steps* and within those steps many *different processes* are applied. In an attempt to summarize those steps, they would include the following phases[xxi]:

Step 1: Introduction of the project.
Step 2: Construction and Installation.
Step 3: ***Economic Sustainability.***
Step 4: Training, Assimilation and Use.
Step 5: Monitoring Aspects.

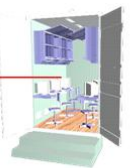
Appendix B: *LINCOS Pictures*

First LINCOS Unit
San Marcos de Tarrazú, Costa Rica

Health and Environment Services



Information and Communication Technologies Lab



Community Life (Videoconference and Entertainment Services)

Appendix C: *Applications*

Since LINCOS units are equipped with a group of multifunctional applications they are selected for each community according to the recommendations of the assessment report. Each of these available applications is briefly described with its services and objectives as follows:

Table 7.

Application	Services	Objectives
Health and Environment	Telemedicine, clinical and water analysis, forestry and soil analysis.	To promote a healthy environment in communities, with the assistance of the local health systems and the communities. This by making use of technological transfer as a tool to maximize communities' potential.
Education and Community life	Constructionist method implementation. Videoconference component to bring long distance education through pre-recorded videos or closed circuit TV programs.	To enable empowerment in disadvantage communities through processes of constructionist's use.
Information Communication Technologies	Information lab equipped with computers connected to the Internet, telephones and other services.	To apply the use of new technologies to universalize the LINCOS services in communities as a tool for local development.
Technology Infrastructure	Two options: LINCOS Platform or any other physical place provided by the State.	To design and construct new applications and spaces for the LINCOS communities.
Business platform	E-commerce, fax services and others commercial services.	To arrange sustainable alternatives for LINCOS units.

Source: Information obtained from LINCOS [internal file] and LINCOS web site.

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In this book we analyze the institutional arrangement between various actors to understand how ICT project objectives flow among actors in a standard LINCOS project and how they would affect the sustainability and effectiveness of LINCOS in particular and an ICT project in general. Since there are many actors involved in different stages and processes of a single LINCOS project, the paper analyses the bilateral and multilateral relationships among these actors to understand the factors that might affect the efficiency of the ICT project. In other words the paper looks at the actors involved in a LINCOS project in an effort to capture those circumstances under which a LINCOS project is exposed to principal- agent problems.

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