

# Evaluating Socio Economic Impact of Mobile Services Intervention in Rural India

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**Abstract**— This paper examines how to evaluate mobile services' intervention impact on socio-economic development of rural India. The existing literature shows multiple ways of studying mobile services impact through different frameworks. The results are non-comparable due to applied methods are different and the problem domain is quite complex. A uniform framework is felt need to undertake research on socio-economic impact studies. Various user-centric mobile services are launched across rural markets. India becomes a field testing ground for most of the multinational firms who want to test their innovative business models. The proposed mixed-method framework, based on the existing literature, may well suit to the present research work. A survey adopting socio economic criteria (SEC) used by Indian marketers for its randomized stratified sample collection is adopted. The sample well represents the entire rural population, as it looked upon head of the family' education and type of house (s)he possessed.

**Index Terms**— Mobile services, Socio economic criteria, Socio economic impact, User needs

## I. AREA OF STUDY

Development of rural areas all these years curtailed due to limited infrastructure. To improve it governments are struggling because of inaccessible terrain, lack of funds and other reasons. The telecom revolution provided a chance to break this development divide to provide basic need-based and user-centric value added services (VAS) at affordable cost to unreachable rural people till now. Mobile usage and acceptance is a phenomenon and observed across all ages, genders, per-capita and areas. Mobile services can make rural user's life easy with time and space. The mobility provides ease of usage of m-services. But most of the users' illiteracy and low per capita are creating a major challenge. It is a win-win model between users and m-service providers in a new field of innovation, creating opportunities to get benefited with emerging business models.

## II. RATIONAL ABOUT THE WORK

India is changing with great pace by inclusive growth on support of technology into the mainstream. As a consequence the development of rural areas brings a challenge to various domain experts including policy makers, researchers and

technology transfer specialists. Emerging markets in particular are playing a major role showcasing how to use technology based information services. This provided a chance for research community (technical, social and domain specific) to develop tools and applications to provide solutions. With these tools, the innovative business models are helping channels to provide potential services. Hence, technology supported services need felt and provide an opportunity to get benefited by adopting to solve basic livelihood problems. M-services have the potential for overall growth and development.

The solution is very clear: support projects that provide user-required and demanded services. The other option is to bring forward private corporates to extend their businesses into rural areas. The social and market driven forces are providing an opportunity to invent new business models to make m-services reach. An innovative idea with rapid and responsible implementation into a creative and useful project is the key. Major projects are providing crop advisory services, market support (input and output) system, social networking and financial support systems which are driving the m-services.

Adding wireless component to the existing limited mobility brings a transition to adopt flexible mobile ICT applications and services. As per Confederation of Indian Industry and Earnest & Young, by 2012, India is expected to have 200 million rural telecom connections at 25 percent penetration rate. The technology (especially mobiles) is gaining a position for itself as a personal entity and occupy in people's pocket along with their money purse, keys etc [1]. The indirect impacts create long-term effect on development rather immediate ones. To get break even, a minimum user density is critical, as the price offered is low. The positive contribution is to standardize a mixed method working framework for rural India, which can be used to assess socio-economic impact of mobile services intervention.

## III. REVIEW OF LITERATURE

While urban community is relatively connected with multiple information gateways, rural India lags far behind. Researchers proved that the multi-faceted inter-linkages across social, cultural, political and economic capitals are possible across ICT-enabled projects in businesses and social organisations [2]. Till date technology intervention brings development is not well proved. But evaluation studies with various approaches are performed and results vary on the same project itself; therefore results cannot be generalized over entire

population [2].

The impact of mobile phones on the lives of new rural adopters, therefore, will be insightful [3]. Nokia-CKS research study point out, certain changes in personal identity, social structure and social network occur then these may be linked to promote business, economic and financial transformations of the people. There are definite benefits of the use of mobile phones in supporting development, although assured criteria is necessary for their application to be successful [4].

Table I

LIST OF PROJECTS UNDER STUDY

Project	Description
aAqua Mini	Local SME Agrocom started agri-domain venture catering to farmers' needs through real-time decision support mobile services. The major strength of the project is agri-advisory on various crops to farmers. The services are provided with text sms and voice enabled mms. This is revenue generating business model with company's strength lying in R&D to develop tools and applications for mobile and Internet platform to cater to socio-economic development of rural areas.
Reuters Market Light (RML)	Reuter's most valued initiation for third world countries is RML project. Its major strength is market intelligence along with automated crop advisory services for farmers. The sms based services are catered to farmers based on chosen crops and markets in their local language. This is public private partnership (PPP) revenue generating business model. Its strength lies in knowledge and information lifecycle execution.
Village Varta	SMSOne is a non-governmental organisation (NGO) catering to the needs of rural people. It is headed and implemented by rural people. Its strength is in providing social information networking across and within villages. The services are looked through as village varta (means news), which is a local sms community newsletter. This NGO based revenue generating business model relies on building rural youth force as social entrepreneurs. It looks at rural youth work for rural people.
Mobile Microfinance / Banking	Ekgaon is a local SME having strength in ICT and management services building mobile based banking and micro finance management for rural people. The services are started with self help groups (SHGs) mostly formed by rural women. The strength of it is to carry out all the banking operations online through mobiles or through Internet at user place and providing action taken receipts. This is private-NGO partnership revenue generating business model with company's strength lying in novel approaches to rural financial services using ICTs and management services.

The demand and need of development depends on timely help in terms of advice about their crops, market information on produce, sustainable financial support for inputs, health of community and their animals, education and sanitation, etc form the basic criteria [5]. Most of the farmers unable to get correct value for their crop yields. They often get as little as 25 percent against 40-50 percent of actual value as in developed countries. In light of this, mobile phones gained footing within South Asia through various initiatives [6]. ICTs by virtue of being carriers and conduits of information play a role in correcting large-scale information asymmetries and inefficiencies that exist in developing countries, especially in rural and unorganized markets. Correcting these asymmetries makes these markets more efficient and raises productivity to some extent [7]. These basic needs form objectives of ICT4D

projects (Table-I) are to serve users with user-centric mobile services. At the same time they have to sustain in rural market for better market linkages. A paradigm shift in innovative business models taking place by push or/and pull based methods. It created an academic interest to study the phenomena.

This literature review (Table-II) is to redress the methodological gaps evident in the previous studies. But the published literature on mobile services impact in the development world [8, 9] is quite small. Fortunately, a small but methodologically diverse set of research studies have examined the mobile services intervention. In this multi-disciplinary research study, country-specific analysis can provide a way to standardize the methodology to implement in future studies. The result from this analysis is a 'standard framework' to study intervention impact going to be fulfilled.

Table III

COMPARISON OF RELATED STUDIES

Studies	Design	Strengths	Weaknesses
R. Jensen, "The digital provide: Information (technology), market performance, and welfare in the South Indian fisheries sector[10]"	<ul style="list-style-type: none"> <li>Quantitative study</li> <li>Econometric analysis</li> <li>Time-series data analysis</li> <li>Micro level analysis</li> </ul>	<ul style="list-style-type: none"> <li>The best quantitative study in the area till date</li> <li>The economic quantification is measured for about five year period</li> <li>Mobile acceptance reduced price in fishing supply chain</li> </ul>	<ul style="list-style-type: none"> <li>The social component of development is missing</li> <li>Mobile acceptance on non-economic poverty is not tested</li> <li>The socio economic development of fisherman was not studied</li> </ul>
R. Abraham, "Mobile phones and economic development: Evidence from the fishing industry in India [7]"	<ul style="list-style-type: none"> <li>Case study method</li> <li>Quantitative study</li> <li>Cost-benefit analysis</li> <li>Micro level analysis</li> </ul>	<ul style="list-style-type: none"> <li>The best quantitative study within case study method</li> <li>Mobile role in information asymmetries in fishing supply chain is measured</li> </ul>	<ul style="list-style-type: none"> <li>The social component of development is missing</li> <li>The socio economic development of fisherman was not studied</li> </ul>
David Souler, Nigel Scott, Christopher Garforth, Rekha Jain, Ophelia Mascarenhas and Kevin McKemey, "The Economic Impact of Telecommunications on Rural Livelihoods and Poverty Reduction: A study of rural communities in India (Gujarat), Mozambique and Tanzania [11]"	<ul style="list-style-type: none"> <li>Quantitative study</li> <li>Individual interview as survey instrument</li> <li>Statistical analysis</li> <li>Both macro and micro level analysis</li> </ul>	<ul style="list-style-type: none"> <li>The quantitative study to find out telecom impact on poverty in rural livelihoods</li> <li>Study was undertaken to build strong evidence based for policy development contexts</li> </ul>	<ul style="list-style-type: none"> <li>It is a general study where the sample is collected from various pilot projects to conclude</li> <li>It is a broader study to know investment vs benefits for rural livelihoods</li> <li>The socio economic development of rural livelihoods were not seen</li> </ul>
Krishna Reddy P., "A	<ul style="list-style-type: none"> <li>Quantitative study</li> </ul>	<ul style="list-style-type: none"> <li>It is a well structured pilot</li> </ul>	<ul style="list-style-type: none"> <li>The social component of</li> </ul>

<p>Framework of Information Technology Based Agriculture Information Dissemination System to Improve Crop Productivity [5]"</p>	<ul style="list-style-type: none"> <li>• Pre-post study method</li> <li>• Statistical analysis</li> <li>• Micro level analysis</li> </ul>	<p>project with base-line data</p> <ul style="list-style-type: none"> <li>• Knowledge &amp; information transfer impact studied well</li> <li>• The pre-post method applied to see the impact on rural people economic development</li> </ul>	<p>development impact is missing</p> <ul style="list-style-type: none"> <li>• Pilot to commercialization stage is missing – so the study loses its strength on results</li> </ul>
<p>Meera, S.N., Jhamtani, A. and Rao, D.U.M., "Information and communication technology in agricultural development: A comparative analysis of three projects from India [12]" Surabhi Mittal, Sanjay Gandhi and Gaurav Tripathi, "Socio-economic impact of mobile phones on Indian Agriculture [13]"</p>	<ul style="list-style-type: none"> <li>• Qualitative study</li> <li>• individual interview as survey instrument</li> <li>• Statistical analysis</li> <li>• Micro level analysis</li> <li>• Qualitative study</li> <li>• Focus &amp; Individual interview as survey instrument</li> <li>• Both micro and meso level analysis</li> </ul>	<ul style="list-style-type: none"> <li>• Implementation &amp; uptake of three projects are studied</li> <li>• Looked well perceived implementer's view</li> <li>• The quantitative study tested well how agriculture extension services can reach to a small farmer</li> <li>• Study co-related productivity with mobile extension services</li> <li>• Well focused qualitative study</li> <li>• Study looked well about social dynamics</li> <li>• In-depth qualitative case study on individuals' life to see the benefit due to mobiles</li> </ul>	<ul style="list-style-type: none"> <li>• The study lacked socio economic impact on rural people</li> <li>• Usage and information needs seen not of their impact on their life become easy</li> <li>• The study looked through all stake holders in extension system rather farmer focused</li> <li>• The quantification of economic component is missing</li> </ul>
<p>Aditya Dev Sood, "The mobile development report [3]"</p>	<ul style="list-style-type: none"> <li>• Extensive qualitative case studies</li> <li>• Case survey of individuals</li> <li>• Micro level analysis</li> </ul>	<ul style="list-style-type: none"> <li>• Study looked well about social dynamics</li> <li>• In-depth qualitative case study on individuals' life to see the benefit due to mobiles</li> </ul>	<ul style="list-style-type: none"> <li>• It is general study on urban and rural individuals</li> <li>• Case survey was not supported by quantitative impact values to generalize the outcomes</li> </ul>

IV. DERIVED METHODOLOGY

Evaluation may be regarded by some as a diabolical exercise and they can contribute to increased transparency, accountability and cost-effectiveness [14]. It may be difficult to identify what effects are actually caused on society by an initiative (mobile services) and to separate these effects from the countless other influences on the socio-economic problems. The evaluation method arrived at from the existing evaluation techniques used to measure outcomes.

Let us consider 'ex-post evaluations' which are conducted either 'upon' or 'after' the completion of an intervention (mobile services). Ex-post evaluations are 'summative in

nature', and are often conducted to express intention of 'analyzing an initiative's impact'. The information needed to assess an initiative's impact may often not be fully available until several years after the services launched [14].

But waiting for several years to study any initiative's impact in the society is difficult. The 'quasi-experimental design' is more practical approach to undertake. Here, control groups still can be used, but these have to be created through some non-random process. Alternatively, one can examine initiative's beneficiaries 'before' and 'after' their exposure to the initiative's intervention. Before-and-after design simply compares the situation after the initiative's intervention with the situation beforehand and attributes any difference to it.

Administering a before-and-after design is relatively easy, but causal inference tends to be quite weak. There is always a possibility that something else besides the intervention may account for all or part of the observed change over time. An improvement on the before-and-after design is the 'interrupted time-series design' [14]. It involves obtaining additional information over time, both before and after exposure, to an intervention in order to create a 'time-series of observations'. But in practice, we can have a variation to undertake the study. The 'counterfactual' can be derived with position of time frame denoted by a simple relationship such as: [(a – b) – (c – d)], where a, b are time based pre and post observations of experimental group and c, d similarly for control group. In other words, it is a 'delayed pre-test/post-test' design with a comparison group. It is a useful design where 'base-line data' does not have. The minimum duration is about 6 months to measure the intervention results.

The intervention is formulated what the situation of participating people (or the treatment group) would have been, had they not participated in the project. This 'Potential Outcome Model' [15] is denoted as:  $T_i = Y_i(1) - Y_i(0)$

where  $T_i$  is the treatment effect for the individual  $i$ ,  $Y_i(1)$  is the prospective outcome for individual  $i$  where and when treated (the concrete outcome) and  $Y_i(0)$  is the potential outcome for individual  $i$  when (s)he would not have participated (the counterfactual). The missing data problem need to be solved by constructing a realistic counterfactual, i.e., the possible outcome if this person would not have participated [16].

One of the 'shortcomings' here is that the relation between project activities and the impacts are not always clearly explained [17]. This is partly due to lack of a comparison to comparable non-participating people. To solve it, a criteria based sample selection is planned here. The classification considered is socio-economic criteria (SEC) of Indian marketeers (Table-III) to cover rural population. These categories are very important since they help segmenting markets effectively and target well to communicate with core consumers [18] across uniformly. In addition to income and consumer classification, households can also be segmented according to the occupation and education levels of the chief earner of the household (the person who contributes most to the household expenses) [19]. The prepared division members share similar values, interests, and behaviour [20].

Table III

SOCIO ECONOMIC CLASSIFICATION (SEC) 1998 MODEL FOR RURAL AREAS [18, 20, 21]

Education of chief wage earner (CWE)	Type of House		
	Pucca	Semi-Pucca	Kuchcha
Illiterate	R4	R4	R4
literate but no formal school (Self-learning/home based oral learning)	R3	R4	R4
Below SSC (<10th Grade)	R3	R3	R4
SSC/HSC (10th or 12th Grade)	R2	R3	R3
Some college education (Not Graduate)	R1	R2	R3
Graduate / Postgraduate (Professional)	R1	R2	R3

**CWE** – the person who contributes the most to the household expenses  
**Pucca House** – One which has walls and roof made of burnt bricks/stones (packed with lime/cement)/cement concrete/timber, etc.  
**Kuchcha House** –The walls and/or roof of which are made of material other than those materials mentioned in Pucca house.  
**Semi-Pucca House** – A house that has fixed walls made up of pucca material but roof is made up of the material other than those used for pucca house. (Def. of houses – Min. of statistics & planning, GOI)

## V. ADOPTED FRAMEWORKS

The project type and necessity form the base for any framework. What we are considering here is a multi-project, multi-disciplinary problem; hence the selected framework could be an appropriate mix and provide at least some degree of compatibility [17]. Based on this, a mix of two frameworks clearly set for the intervention of mobile services study is adopted.

The first one is a four dimensional general one for any kind of intervention process: ‘input-output-outcomes-impacts’ framework, which stresses the need to identify the relationships between project activities and the impacts measured, and the measurement of impacts at different levels of ICT4D resources and processes. The main focus is on assessment of impacts rather than other value chain stages [17]. Undesirable outcomes are unexpected outcomes that a group did not want to happen but which did happen [17].

Measuring the impact of a project thus requires a multi-dimensional perspective. The ‘sustainable livelihoods framework (SLF)’ provides an all-embracing framework for assessing the impact of projects on individuals and communities based on context, assets, institutions, strategies and outcomes. The points of intervention and impact of projects can be mapped on SLF, as an attempt is made in development projects [17, 22, 23]. The framework views people operating within a context of vulnerability in which they have access to certain assets [24]. The influence over, and access to these assets is partly determined by the prevailing social, institutional and organizational into five capitals: financial, human, natural, physical and social. It provides ‘flexibility of indices selection’ from ‘each capital’ before undertaking impact study.

## VI. ADOPTED EVALUATION METHOD

The adopted evaluation methodology is to interview about: change - "before" and "after" in terms of asset changes, and causation - investigating how the change was causally related to the ICT4D [17]. Hence, the change is measured with ‘delayed pre-test/post-test’ design with a comparison group and causation is measured with ‘input-process-impact’ combined with ‘sustainable livelihood framework’ choosing indices from capitals on need based. This evaluation methodology is the basis for ‘mixed evaluation framework’ design to measure mobile services intervention impact.

## VII. RESEARCH STRATEGY

To study mobile services intervention impact, a two-phase research approach adopted – a case study approach and a semi-experimental approach, namely the qualitative and quantitative phases. By combining these two a realistic counterfactual can be constructed.

### A. Semi-experimental approach

The quantitative answer to the research question is planned using a quasi-experimental design that a comparison is possible because of naturally occurring ‘treatment groups’, i.e. ‘participating population’ in the project areas versus ‘non-participating population’ (i.e. control group). Apart from their participation in the project, the participating people and the non-participating people need to be as homogenous as possible. Besides constructing the ‘counter-factual’ based on the comparison of the socio-economic situation, a ‘before-and-after counterfactual’ is constructed using the ‘baseline data’ if available, else a ‘delayed pre-test/post-test’ is conducted.

### B. Case study approach

Case study research more often recommended as part of a ‘multi-method’ approach [25] (i.e. ‘triangulation’) in which the same ‘dependent variable’ is investigated using multiple additional procedures (e.g. survey research, cost-benefit analysis, etc) [26]. The case study is used as a framework to collect and document evidence about a phenomenon. It is applied in a vertical approach to study in-depth mobile services intervention of each case (project). Not only observational study, a qualitative measure is incorporated along with focused and open interviews. In view of the fact that the ‘causal links’ between the outputs and outcomes of the projects and the socio-economic well-being of the communities are ‘multi-faceted’ [27]. Hence case study approach is useful in answering part of the research questions.

The ‘multi-case study approach’ follow replication logic not of sampling logic, each individual case study consists of a ‘whole study’, in which facts are gathered from a range of sources and conclusions drawn on those facts [28]. It is an essential part in multi-case study, but desirable for a single-case study – a case protocol should contain more than the survey instrument [29]. It is desirable when the intent of the research is descriptive, theory building, or theory testing. It permits us for cross-case analysis and in turn contributes towards extension of theory. Multiple cases yield more general

research results [30]. Hence, a multi-case study based cross-site analysis is adopted.

### VIII. CONCLUSION

India is a complex country in which each state has its own cultural, social and economic variations. Hence the study has to be limited to a particular state where most of the projects are operational for a minimum time with sufficient number of users available across all its regions. The user density across all regions within a state is the limitation to undertaken intervention impact study. The proposed mixed method framework is adopted using existing methodologies and frameworks available in the literature across various disciplines.

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