



Facilitating successful global research among Engineering and Technology scholars: The case study of agricultural supply chain

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I employ a combination of structural equation modeling, social network analysis, and ethnographic research methods to study the design and implementation of technologies for social and economic development. Theoretical perspectives I draw most on include communities of practice, social construction of technology, actor-network theory, technology acceptance, social selection and influence.

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International Division

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3. International Collaborations, Experiences, Partnerships, Service Learning

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Abstract

With the increase in demand for the global research, scholars in engineering and technology discipline do not hesitate in taking up global opportunity for conducting research. Scholars may lack the skill set to work in an international environment and encounter many surprises during field research, directly impacting their productivity. However, prior information regarding climate, work, and traditional culture, etc. will help scholars to acclimatize faster and produce effective results in new environment. Current research utilizes case study method for data collection and data analysis by drawing on experiences of the authors while conducting 18 months field research in Chhattisgarh, India. Where author one and two worked with various government and private sectors investigating the role of technology adoption and innovation in improving the efficiency of agricultural supply chain addressing the issue of global food security.

This research highlights the potentials and challenges of conducting research in global setting. Additionally, the authors have developed a model that can be adapted by engineering and technology scholars to conduct research effectively in global environment. Furthermore this paper includes different ways in which international collaborators can be efficiently involved in the project (i) before reaching the field, (ii) during the field research and (iii) once the researcher has left the field. This helps build sustainable relationships between engineering and technology scholars and their international collaborators, which increases the proficient exchange of information, which is linked to positive outcome of the project. Lastly, this research enables the engineering and technology scholar to work with underserved communities globally and address the challenges faced by those in their communities in their day to day living.

I) Introduction

Various study requires the scholar to leave their comfort of office or lab and step onto the field to collect data, understand practices, find relevant methods to analyze data and find meaningful conclusions and recommendations. With the increase in globalization, international research is not just limited to social science or anthropology field¹. However, scholars from various fields now need to collaborate and travel to international locations to conduct field study. Field study is defined as spending time in field and learning from personal observations, interviews, and discussion with field experts².

International research facilitates cross culture dialogue among researchers and requires understanding of field². International research allows researcher to develop a long-term relationship with various international organization. However, the culture of each country is different, which makes international research to be both exciting and challenging³. Challenges are further intensified when the researchers from developed nations attempt to conduct research in developing countries. In this paper, we will focus on researchers from a public institution, located in the Midwest, representing Land Grant Universities in United States of America, conducting research in the remote and distant location in central India, in the Chhattisgarh state. Researchers from this university were in field, to understand causes of food insecurity.

There are 870 million food insecure people worldwide, which translates into one in every eight person sleeping hungry every night⁴. Ninety-nine percent of worldwide experiencing hunger are

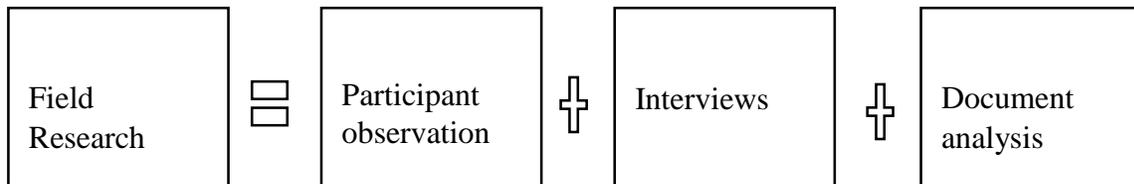
in developing countries. India being a developing country, accounts for 23 percent of world hunger⁵. The Indian government runs various food security programs to feed its population. Still, the problem remains unsolved due to various reasons such as black marketing, theft, diversion etc⁵. The researchers were focused on understanding ways in which the Chhattisgarh state is fighting this challenge of hunger. They chose Chhattisgarh state since researchers and scholars have called this newly formed state (formed in 2000) as a turn-around state and addressed the issues of food insecurity by making changes in policy, technological intervention, and strong government support^{5, 6}.

While conducting social science research, it is required to step in the field to understand the ground reality¹. Before stepping on ground, scholars are required to do the background work, not just in terms of literature analysis, but to understand the field requirement, culture practices, and customs of the region in which they will be working. These will not only help in getting work done smoothly but establish long term relationships that build sustainability into the research enterprise.

II) Field research as a part of global research

Field research is a qualitative method of data collection geared towards understanding, observing, and interacting with people in their natural settings². Some of the most valuable information in the world cannot be found in libraries, papers or laboratories, but these information is crucial and is available in the real place. Real place is a place where the action or work is being done. There is more value in gaining such information by exploring these research venues. Research which is conducted by visiting the site is known as field research². It consist of participant observation, interviews and document analysis as seen in figure 1⁷. Field research can be very exciting and rewarding and at the same time extremely overwhelming. It is important to know what kind of information needs to be collected at the time of such research. Since the field is full of stories and actions, one can easily become lost in the scenario, hence having a bigger picture and focusing on the specific research question(s) is a very important component of the field study². However, one cannot neglect important relevant incidents and make an informed approach. Similar to any other research, field research also requires to systematic collection of information that contributes to the understanding of the challenge and to organize those outcomes in a cohesive and persuasive fashion that proposes a new insight, answer or solution.

Figure 1: Field Research



III) Case Study: Research conducted by Authors

Step 1: Researcher first contacted rice millers through formal and informal network from USA by calling rice mill owners in India. This initial group was identified since, as businesses, represented the most organized group of participants located within the chain of participants. Online rice miller association website was used to contact the governing body over the phone. Phone calls were made since most of the rice millers didn't use emails often. Prior to calls to rice millers a script was made to address the rice millers and explain them about the research proposal. At the same time researchers contacted rice millers through informal contacts (relatives, family friends etc.) since one of the researcher was native of site of research. After reaching India researchers met with pre-selected participant individually at the place of their work (rice mill). Primary language spoken at the research site was local language and two of the researcher are well adverse with the language and culture of the site. Without this advantage, the field study would have taken much more time to set up and conduct.

Step 2: In the field, a schedule for face-to-face work was established. By spending time with (~25) rice millers and based on archival research, schematic of supply chain of rice in the research site was constructed. This became crucial to identify all current and potential participants and set boundaries of field study efforts. Later researchers collected information about the key government officials who are involved in day to day working of the rice mill and make an impact on policy for the rice supply chain.

Step 3: Various government stakeholders were contacted and time to meet them were selected. With the help of secretaries in Government offices, times were arranged to meet with key government officials in the district who are indirect contributors in the supply chain as they make policies and implement those policies. Various stakeholders were contacted and time to meet them were selected. This step was done while being on field. Most of the time sample was selected through snowball sampling by getting referrals from one agency for the other.

IV) Study overview

At the research location, emails are not used widely by the participant group. So it became important to get a local phone number to contact people or vice-versa, in addition renting a transportation to visit all the field sites. At all-time researchers carried University identification card and business card. It was important to assimilate with the culture and dress modestly preferably in tradition Indian attire. We had to adhere to their working hours which was different for each stakeholders. Setting up the meeting with a personal was no guarantee of their availability, which was sometime challenging.

After recruiting business owner from individual organization it was important to gain more insight by recruiting employees of the businesses. Owner's permission was sought before recruiting employees from the organization. Owner was informed about the employee's participation at the beginning of the study itself. With the owner's consent, interviews was conducted with the employees. Recruitment of employees was done by posting flyers in cafeterias, break room and other common gathering places. Once the appointment is setup, researchers met them on agreed upon time.

The study was conducted on the business sites. It was made clear to employees it would not affect their job and no information provided would be shared with their employer to use against them. Data shared with employers was aggregate of the findings from the study. Employees were interviewed on-site (business owner facility with closed door allowing only participants and researchers). Prior permission from their managers was taken to ensure employees didn't lose their pay at the time of interviews.

Two out of the three researchers were the individuals collecting data and are of Indian nationality who speak, read and write Hindi, and Chhattisgarhi which is the language spoken locally in the states being visited. These researchers enjoyed culturally appropriate access to the research sites given that s/he had previously lived in or traveled through the states where the data would be collected. One of the researcher who was American national was accompanied by other researchers to the site and all the conversation was translated for him. In addition, all the research was carried out in accordance with U.S. and Indian regulations. Any changes to the research design, including the interview protocol or the size of the study was submitted to the respective university internal review board (IRB) for approval. Any unforeseen changes or issues during the research study was immediately brought to the attention university IRB. No changes to the study design was initiated without first securing approval from the IRB. In order to ensure complete professional oversight over the data collection process, researchers established a secure online repository where all the data collected in the form of written notes, audio and visual recordings were uploaded. Access to the data on this repository is limited to researchers and IRB.

V) Recruitment of subjects

At the time of recruitment of subjects: (a) a short introduction and purpose for the study, (b) an explanation of what will be required of participants, (c) their rights as participants, and (d) then permission to conduct the interview at a time and location of convenience to the potential participant was requested. Before seeking permission, the researchers provided participants with an information sheet and explained the potential risks and benefits associated with participating in the study. Researcher requested verbal consent from each participant. If verbal consent was received, the co-investigator requested permission to record the interview with an audio recorder. The interview was only recorded only after permission was received from the participant. Interviews were conducted in Hindi.

VI) Potential risk to the subject

Before collecting data, it was important to evaluate potential risks to participants. Involvement in this study entailed only minimal potential risk to participants. The potential risks of participating in the study were not more than the risk involved in everyday activities. There was no physical risk associated with participation, and participants were not asked for any personal information except their age and occupation. To assure that participants were not uncomfortable or experience an unreasonable amount of stress, they were notified in advance of their rights to refuse to participate in the study or to divulge certain information. They were also made aware that pseudonyms were used and all information would be kept confidential.

VII) Confidentiality

The audio recordings were transcribed and saved as word documents on a standalone personal computer belonging to the researchers in the field. All the transcriptions remain

confidential and anonymous and all identifiers were removed from the data so that information/responses could not be traced back to any respondent. Data on all paper documents including informed consent forms, surveys, were de-identified and stored in a locked cabinet in the researchers' office later. Visual records in the form of photographs and video recordings were only accessible to the researchers associated with the study. Only those photographs and video recordings which do not (for example, photos and recordings of technologies, their operation, public events) contain information specifically identifying particular individuals were used in research presentations and publications for illustrative purposes. The researchers indefinitely stored the audio recordings, transcripts, photographs, and video recordings, which have been edited to remove all identifiable information on participants. While on-site data was stored on researchers' computers, which were password protected and were with team at all times while visiting field sites. All the data translation from English to Hindi was done by research team itself.

In June 2014, research was successfully completed and results were generated. One of the reasons for the success of the study was readiness in the field at the time of data collection. The next section describes the various steps taken to ensure the field study readiness.

VIII) Results

Starting research and gaining access

For many qualitative researchers undertaking fieldwork, "gaining access" is the first obstacle to overcome. Gaining access involves securing entry into a particular organization and making sure that the individuals associated with these organizations will serve as a reliable and accurate informant for the research⁸ (Shenton & Hayter, 2004). The framework recommended by Johl & Renganathan, (2009) was employed for gaining research access⁹. Access could be gained in formal or informal ways. Prior to entry in the field, it is required to have made connection with whom you will work with, this can be expert in the field or someone/organization who will be helping you to get access to the field.

Establishing contact prior to arrival

This is usually done with the local person who understands the field or belongs to that area, most of the time that person is someone who can speak the local language and is well versed with the culture⁸. Such conversations can be initiated via electronic form of communication such as email or phone call. Before initiating such conversation, it is important to know the reason for the call, making cold calls would not have much benefit. It is also important to emphasize the benefits and outcome of the research. Informing the contact person about anonymity, confidentiality and intellectual property protection protocols is important. If there is any risk involved in the study, it should be made clear at this point. Furthermore, number of participants, and type of participants should be made clear. Information regarding incentives offered to participate in the study should be communicated. Fixing an appointment to meet based on availability of the interviewee. This process can take up to few weeks to a few months, followed with multiple email or call exchange. It is better to keep account of delays due to establishing contact.

Travel Plans

All the researchers travelling for data collection need to get a specific visa required. Each country will have different norms on what kind of visa is valid for data collection, often time it is advised to conduct field research on a tourist visa. Specific country embassy needs to be contacted prior to travel and required time should be given to obtain visa. Before applying for visa ensure passport is valid for at least six months past the date of travel. Other documentation needed for travel should be collected accordingly. Travel plan should be made once the visa is obtained. The primary healthcare physician should be consulted before traveling to ensure specific vaccine requirement to enter the research country and precautionary medication should be carried. Time in field is very precious, so there is no point risking health and ensuring proper safety.

Before travel it is important to check if there is any outbreak of disease, terror attack or tension between the countries, which might risk individuals' safety. In such case it might be beneficial to delay travel plans. Any national holiday or festival in the country should be accounted in time as work participants might be on holidays. If one needs to travel to remote locations, detailed travel plan needs to be made. For example, road transportation might not be very safe to take in the night in certain countries. Women traveling alone may not be safe in such scenarios alternative solutions should be considered¹⁰. It is also important to know the US embassy location in the research country before travelling on site. Making note of embassy address and phone numbers can turn out to be very handy.

Entry/Exit

At the time of entry or exit some countries might require to pay the taxes, to ensure researcher is carrying enough money to account for such expense at the time of transaction in the airport. If you have recently visited certain countries, make sure that doesn't affect your entry in the research country. Ensure you carry specific immunization record needed to enter.

Social culture

In order to be respectful and mindful of individual's culture, gaining a prior understanding of what are acceptable norms and what are not is crucial⁸. For example, in India, it is not ok to call government officials by their first name until and unless they have invited you to do so. Using suffixes such as sir or madam is very common. Shaking hands is not a very common practice, especially with women¹⁰. In rural parts, there exist a male and female segregation to be aware of at the time of data collection. Sometime wearing shorts by male or female is not considered normal. It is useful to invest some money in buying a couple of pair of local garment to assimilate in the culture. It was observed by the researchers that when they wore cloths like others in the community, their participants were much more at ease. Learn proper forms of greeting, for example in India, 'Namaste' is used instead of 'hello'. Learning such small things has a greater impact on field research. Lot of time culture from one region to another within a country might vary and should be accounted for.

Food

Every country has a different kind of food, make sure you eat hot food to avoid any infection. Drinking a good brand of bottled water might be essential. People eat at different times and in different styles, which should be accounted for. Sometime it is not a bad idea to carry

some snacks to account for variety of eating schedules, especially if it creates downtime in the field, outside of informal interactions during meals.

Use of technology

Technology plays very important role in collecting data, storing data and communicating with people. Make sure you carry all the right technology and backup for the field work. Sometimes it is beneficial to not carry too much technology during the field research due to risk of theft and intimidating people. For example, if the survey needs to be filled by participants in rural areas, make sure you don't use ipad or laptops for data collection. Instead, using a simple pen and paper survey will make participant much more comfortable. Also sometimes getting a local phone number might be useful to be in contact with people and ensure safety.

During fieldwork

It is important to adapt to cultural norm and dress appropriately, take an account of difference in language and accent and be respectful of that nuance. Before tape recording, participants should be informed and their consent should be taken. Ensure to inform family and university in timely manner about your safety and progress while in field. While exiting research site it is important to leave on a good note and this will help in any future field work. Also try any opportunity to learn about the culture, remember field research is not just about how people do things to perform specific tasks, which is your area of research, but what are the external factors, which effect people and motivate to work in that manner.

Research ethics

It is important to maintain the research ethics for maintaining integrity, validity and securing participant identity in the research². Researchers need to abide by the University IRB requirement. The entire participation of the participant in the research study should be voluntarily. All information (including facts and opinions) exchanged should kept strictly confidential by the researchers involved in the project. Any information that might directly or indirectly which will reveal participants identity should be kept strictly confidential. If the interview process becomes distressing, uncomfortable or participants do not want to address a particular issue or question, participants should have the right to stop the interview at any time without having to give reasons or explanations. Participants should have the right to demand that any or all information they have given, be deleted from the notes at any time. Participants should have the right to access all publications resulting from this study.

Notes, audio, video, photographs and any other form of recordings should be kept confidential which can put participants' situation at stake. The potential risks of participating in the study are not more than the risk involved in everyday activities. There is no physical risk associated with participation, and participants should not be asked for any personal information except their age and occupation (if study doesn't require any more personal information). Proper code of conduct and research ethic should be followed by researchers for conducting research. No data should be manipulated to get expected result.

After fieldwork

It is important to send a thank you email or call to the proper organization. Findings and results should be shared with them. Building upon the field study is essential toward creating a

sustainable model for research. Follow-up is important in terms of communicating gratitude and professional courtesy. Reciprocity in work is a medium in which researchers are comfortable in working and building lasting relationships, crucial to gaining and maintaining working outside of one's own nation.

IX) Conclusion

Conducting field research is a rewarding and challenging endeavor¹¹. Gaining a different perspective for the researcher working outside one's own origin, or, working back in one's native place is rewarding. The novelty brings perspective to one's own ideas, often resulting in a greater respect for diversity, whether that be thought, opinion, or character. In today's global economy, it is becoming less common for one in the academy to not work with, or teach, someone from another nation and/or culture. As students are being educated to learn about the global community, academics are discovering the same advantages that results in new combinations, connections, and networks of ideas that result in novel approaches, especially in the technical and engineering areas. Depending upon the perspective, the endeavor serves meaning to the individual.

As one conducting field research back in one's own nation, the research may inspire passion in the subject based upon the exchange one has had in receiving an education beyond the native for the impact one can give to the local, state, or national community. For those studying outside their nation, the power of direct observation cannot be understated. While field study is based upon the sciences, observation immersed in another's culture changes the researcher's perspective of their own background, preparation, and work. However field study is rewarding, the work presents challenges as well. The preparation needed to ensure that the field work is productive requires planning and preparation². Mainly, this time helps the researcher be prepared to change, sometimes based upon issues that could be basic assumptions in one's own culture and require flexibility. Being in the field will make that which is unknown known. In addition, it may also make what one knows beforehand, become unaccustomed.

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