NapoNet: Presenting A Business Approach to Development in the Peruvian Amazon

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ABSTRACT

The present work demonstrates results from a study of agricultural markets in the Peruvian Amazon. The goal of the study was to determine how a business approach (using improved communication with the present infrastructure) could improve agricultural market efficiency. More broadly, it seeks to determine the feasibility of using a specific business model to support development goals. The study includes a theoretical understanding of a business model approach to development, as well as results found in practical application. Application was carried out in a series of business model elements, including the creation of a business canvas, value proposition, and set of hypotheses to be validated. These hypotheses were tested in an interview process in several communities in the Peruvian Amazon. Results from market research involving individual market entities (producers, transporters, salespeople and end users) are detailed. Findings contributed to the business model and a consequent systematic business structure to achieve a final goal of providing value to producers and end users through an entrepreneurial approach.

Keywords: development, entreprenership, Peruvian Amazon

1. INTRODUCTION

The developing world is characterized by food prices that are much higher in terms of average income than in the developed world. In the case of the rural parts of the developing world, supply chain inefficiencies certainly contribute to this discrepancy. One can hypothesize that improved communications and interactions between end users, transporters and producers could improve overall market efficiency. Various forms of telecommunication, both public and private, are penetrating into rural areas such as the Peruvian Amazon. Economic incentive for rapid telecommunication development is weak in rural areas due to the low population density and high cost of infrastructure uptake. In the present work, the potential of rural communication to spur economic growth in areas of the Peruvian Amazon is investigated. The focus is on applying business models to the use of present communication infrastructure in the supply chain inefficiencies in the hope to incentivize development.

1.1 BACKGROUND

1.1.1 HISTORY OF THE NAPONET TEAM

The NapoNet research team, based out of the University of Colorado at Boulder, was first involved in the Peruvian Amazon in 2009. It is a group of students and faculty involved in development-based engineering; especially with respect to applications of communications technology. The involvement began with interest in the Wireless Long Distance Network (WiLDNet) installed on the middle and upper portions of the Napo River in northern Peru. This WiLDNet was funded by the United Nations Global Fund to Fight AIDS, Tuberculosis and Malaria as a measure to promote the health of the river communities along the Napo River in Loreto, Peru (Mickelson et. al., 2012). The NapoNet team found interest in different applications of the network, and since its initial involvement in 2009, worked on network uses in the realm of education and health. It soon became apparent though that the people living in the Napo River Basin desired support in agriculture. NapoNet team members began to consider a business approach to support the people who rely on agriculture and fishing to support their livelihoods and those of their families. This shift in thinking rose from the idea that empowerment could be the most promising means to affect the innumerable elements of development, and that a systematic approach to this empowerment, through business, would be a method to accomplish this impact.

The NapoNet group has been deeply involved in assessment of their own learning (Ritter et. al., 2013) as well as in the assessment of interventions (modifications) they have carried out on the WiLDNet (Mickelson et. al., 2012). As much of the rest of the world has noted (especially expressed in the recent history of Engineers Without Borders), technology is not a panacea. One needs to have deep understanding of social and economic conditions in order to identify correct technology to apply. Further, sustainability of any advantage obtained from a developmental intervention requires not only community acceptance but that the community embraces the fruits of an intervention. A rigorous test of sustainability is economic sustainability, or better, sustained growth of numbers involved and effects of an effort long after the originators have moved on. In this work, the NapoNet researchers attempt to apply a business model to their proposed innovations before ever carrying them out.

1.1.2 GEOGRAPHICAL BACKGROUND

The NapoNet team began its work in communities along the Napo River. Future work will concentrate on these communities as well as those in other river basins in the Peruvian Amazon. The Napo River can be found in the department of Loreto, Peru. This department is the largest department of Peru, and is mostly comprised of the Amazon Rainforest. The largest city within Loreto is Iquitos, with a population of more than 370,000 people ("UNSD"). While a substantial city center, Iquitos lacks the road infrastructure that might be expected of a city of this size. In fact, it is known as the largest city in the world without any roads connecting it to another city (Espinoza et. al., 2013). All travel to and from the city must be by boat or air. While the Napo River does not directly run into Iquitos, it feeds into the Amazon to the north of the city, and then continues northward until it reaches the Peru-Ecuador border. Hundreds of communities find residence on its banks. The majority of community members produce some sort of agricultural good or fish. The geography of the region presents constraints that these producers face, especially in the transport of these goods. Some producers must spend up to a week traveling with goods to bring them to the market in the city. The distance increases the inefficiency of the system as it leads to spoilage of goods and a significant time cost.

Another important characteristic of the Napo River is that it floods annually. This flooding affects everything from river transportation to the growth of crops in and around the communities. It also makes growing seasons highly variable in that many plants are susceptible to ruin due to flooding. Flooding also affects the markets in Iquitos where goods are sold as supply and price of goods changes.

Figure 1: A community on the Napo River. Many producers interviewed come from similar communities.

1.2 THE CURRENT MARKET SITUATION ON THE NAPO

1.2.1 AGRICULTURE AND FISHING

A majority of the river inhabitants rely on agriculture and fishing to some extent. Crops are grown for the purpose of personal consumption as well as for sales. Fishing follows the same pattern of utility. Common crops include plantains, yuca, corn, rice, papayas, and mangoes. Farmers face several decisions in the entire process of cultivation, harvest, and sales. They must choose which crops to grow and which agricultural practices they want to follow to grow these goods. They must choose whether or not they are going to produce for personal consumption or for sales. If they deem that they have enough quantity to justify sales, they find themselves in a daunting process of getting those goods to the market

1.2.2 TRANSPORTATION

Producers again face several choices, this time regarding the transport of their goods to the market. Some of these choices depend on the distance required to travel from their community to the market. Personal transportation generally consists of canoes or small wooden boats with a small motor at the back. Operation of boats with motors is significant because of the cost of gasoline. Smaller canoes require paddling, which is not efficient with regards to time and crop or fish spoilage if the distance to market is substantial to any degree. Large boats called "lanchas" are constantly in operation. These boats have space for cargo such as crops, fish, and livestock, as well as space for travelers accompanying their goods to market. Lanchas can be very slow, as they take an entire day (24 hours) to move from the middle Napo River communities to the port in Iquitos. From the upper Napo River communities, lanchas can take up to a week. As mentioned previously, these days are precious as goods start to spoil as soon as they are harvested or fished. Producers also do not like the costs that they are subject to in lancha use. They must pay for their own passage on the lancha as well as the passage of each good in the cargo space. Costs like this add up depending on the quantity of goods the producer brings to the market.

Figure 2: Producers transporting their goods via canoe – a specific example of transport used by market entities in the commerce process

1.2.3   MARKETS AND PRICE VOLATILITY

 Locally, it is common knowledge that the producer can sell crops or fish at a higher price at the market in Iquitos, rather than to travelling buyers or in other river communities. There are several markets located in Iquitos and also in the other large communities nearby, such as Mazán. At these markets, goods that originate from communities on several rivers are sold. It is rare to actually see a producer selling his or her own goods at a market. Generally, salespeople buy the goods directly from the producer and then spend time at the market selling these goods. The price of a certain good, therefore, increases as the good moves from the lancha, to the port, and then into the market where it can then be sold by these salespeople. The farmers or fishers do not receive the same price for their goods as the salespeople do. Producers, instead of staying to sell their goods, often attempt to return home as soon as possible. Any additional time spent in Iquitos leads to increased costs for the producers, as they must pay to stay in Iquitos and for food while they are away from home. They instead choose to sell their goods quickly, for a lower price to whoever happens to be at the port.

Price volatility within the markets of Iquitos and wherever producers sell these goods is a continuous element of sales. Prices can be affected by climate, flooding, quantity of goods, and many other factors. Along with this, the value of a good itself can change depending on where in the supply chain it is sold, and its level of maturity or ripeness. Crop or fish spoilage directly affects the value of the goods and therefore the price that the seller can command for that good. Current and historic price information shows that one "racimo" or unit of plantains can be sold directly to middlemen in the communities for a reported three soles each. This can be compared to reported values of 18-45 soles per racimo in Iquitos. These values are compared along with relative costs of transportation and other costs incurred in selling goods in Figure 3.
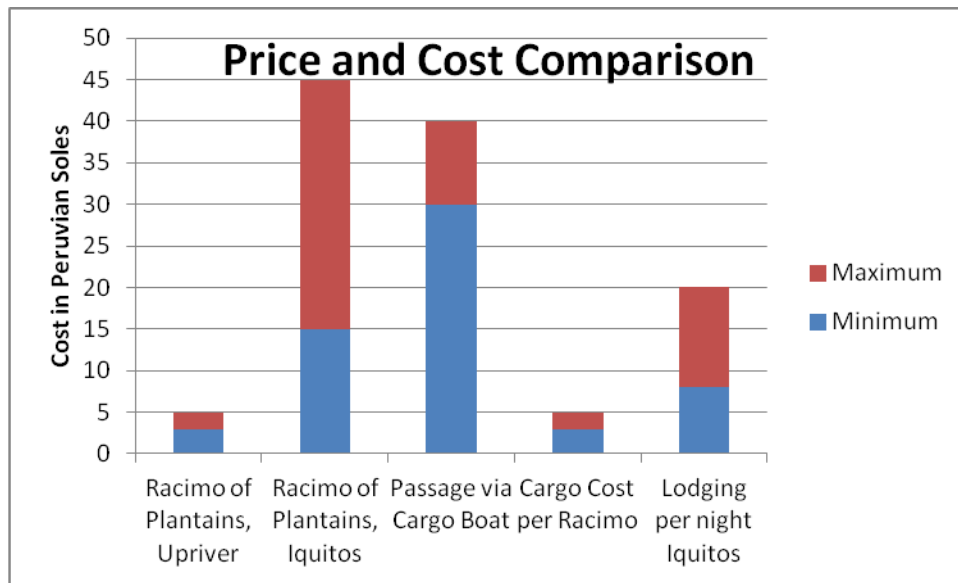
Figure 3. Plantain prices and other costs incurred by producers for comparison

With these prices and costs, it can be understood that a producer must face several choices in the sales of crops or fish. One can also understand how market inefficiencies and lack of communication hinder the entire process. Often many producers choose to grow and fish only for personal consumption, because the prices incurred in moving goods to be sold do not make the enterprise worthwhile.

2. THE BUSINESS CANVAS MODEL FOR DEVELOPMENT

2.1 BUSINESS AND DEVELOPMENT

Microfinance may have been the first well-documented approach to entrepreneurship as an approach toward development. The idea was presented by Muhammad Yunus through the Grameen Bank. He argued that the best way to facilitate economic development (other facets of development would naturally follow) was to empower the very subjects in developing communities to help themselves. He noted that barriers to entry were extremely high in developing communities with regards to entrepreneurship, and that even small loans might allow people to start a business or a small enterprise that might serve the people around them, and allow them to make money to repay the loan as well as to support themselves. While the microfinance ideology has seen differing results in worldwide application, it represents a more formal beginning of entrepreneurial thought for individuals in the developing world (Yunus 2014). Yunus began the idea of working with individuals to support their own work on a large scale, which is compounded by the NapoNet team.

A more recent origin of business approaches to development comes from Paul Polak, and his books *Out of Poverty* and *Business Solutions to Poverty,* which chronicle his "non-traditional" approach to fight poverty worldwide. Polak's books and his work focus on offering design solutions for the large portion of the world in developing communities, and viewing these design solutions as a business opportunity. Polak advocates a for-profit business structure as the most effective and scalable way to fight global poverty (Polak et. al. 2013). The corresponding argument presented by Polak is that economic sustainability is a measurable development goal and a business structure promotes this development and its propagation.

Since these two theoretical approaches were introduced, several smaller entities have adopted different techniques

in practice to use market power to help alleviate poverty. A synthesis of these two approaches combines the empowerment of entrepreneurship as well as the value of design solutions. This is the theory behind the work NapoNet does in the Peruvian Amazon. The ideal model would be to use the "bottom-up" or "grassroots" approach lauded in development theory in that it would focus on working with the users (the affected individuals) to find what is feasible and actually valuable to them. A factor of empowerment would progress as the individuals themselves would gain market power through their business transactions, and through a membership association, have additional power over their own agricultural or production business. The business aspect of the model will allow this to be a system that supports itself in a systematic and economic way. The two elements of business affect each other; as a business that provides true value will be successful, allowing it to grow to provide more value to customers and users.

2.2 THE ORIGINAL IDEA AND BUSINESS CANVAS

The Business Canvas Model was first presented by Alexander Osterwalder. Since it was first presented, Osterwalder published a book in 2010 titled *Business Model Generation* that can be used in the generation of any type of business model. This specific method of business model creation seeks to collect all entities of interest, and the actions that these entities must fulfill for the start and maintenance of a successful business. It then can be used to create a value proposition and a set of hypotheses that support the value proposition and correlate to the separate items on the business canvas. These hypotheses must also be confirmed (or denied) in order to prove the validity of the business, and the value it displays for the customer segments.

The NapoNet team created the first draft of its business canvas in the fall of 2013. This canvas was based off of the initial value proposition also created at that time, which essentially stated that farmers on the Napo River in Peru wanted to make a higher income for the work they were doing, and that an organization between all market entities would allow this income increase to occur. A second draft, based on further market research (mentioned further below) is shown below (Figure 4).

Key Partners	Key Activities	Value Proposition	Customer Relationships	Customer Segments
Local Radio Station Boat Association Retail Associations	Drive Growth Data for Efficiency Research	Market Certainty	Reliability Transport	Restaurant Owners Transporters (Existing)
	Key Resources Information Technology Market Research Aggregation of Knowledge Providing Trust (unbiased)		**Channels** Trade Association (self-organized) Facilitators (for reliability) Owners of warehouses Bundlers (of orders)	Transporters (New) Retail Food Markets Boutique Food Merchants Food Processing Plants
Cost Structure (Costs)		**Revenue Streams**		
Salaries for Facilitators Transport Costs Data Collection		Membership Sales Tax Transport Fees		

Figure 4. Business Canvas

The original configuration was based on the idea that an organization offering membership could include

producers, transporters, and end users (such as restaurant owners and wholesalers) to connect these groups more efficiently. A form of communication, such as cell phones, would allow these different entities to decide on transactions before the movement of goods, and to organize the logistics of transport and delivery. Initially, the NapoNet team had decided to use the WiLDNet as the infrastructure that could handle this organization, but subsequent research showed that the organization itself was more important than the choice of infrastructure and that cell phone networks or radio might function for this purpose as well. While Figure 4 shows a more recent business canvas, the original included ideas that supported a willingness to make transactions before moving goods. It also featured statements (especially in the value proposition) that people wanted more organization in the realm of commerce than they currently perceive. Some of these ideas withstood the test of the hypotheses and some required alterations to remain in the business canvas.

2.3 THE VALUE PROPOSITION

A value proposition might be the most important of a business canvas in general. More specifically, the value proposition is what allows a business approach to development to be more "bottom up" in its execution. A business will not succeed and be able to sustain itself if it does not offer sufficient value to the customer. In a development sense, it can be said that development projects are not functional and of value to the communities for which they are intended if the community does not wish to have the project or commit to involvement. In development, the "grassroots" approach has been praised for its desire to work with communities, rather than to subject them to unwanted projects. The critique of "grassroots" approaches, though, is that they tend to not affect people at a large scale. The value proposition allows the same specific care for the individual while creating a system that should serve a larger group of people.

In the case of the NapoNet team, the value proposition serves to focus on the interests of the market entities. The most important part of this is to have a complete understanding of what exactly the customer values. The main value that NapoNet seeks to provide is market certainty. Certainty refers to price stability as well as comfort in a transaction situation. The actual methodology that led the NapoNet team to this value proposition is detailed later in the current results and conclusions. As an element of the business canvas, it is imperative to continually monitor the relevance of the value proposition. This serves the purpose of maintaining the business viability as well as reaching development goals, in that the customer's willingness to purchase a good or membership allows the business to succeed or fail.

Elements of a business system offer different values to the various customer segments. This is especially important to the NapoNet team, as a fully inclusive business solution requires offering value to all segments.

2.4 HYPOTHESES

A set of hypotheses based on the different sections of the business canvas were created as a way to test the value proposition against the actual situations in the Peruvian Amazon. Initially, the hypotheses found a basis in the assumed business structure and basic systematic ideas. These are meant to change based on continual testing, and have changed after the first iteration. Some of these initial hypotheses are shown in Table 1. Each hypothesis corresponds with a section of the business canvas, and must be proven true to become an actual part of the business model. Some of the key points presented in these hypotheses include the desire for producers to earn more money to support themselves and their families. Another is that a means of communications is available to facilitate the connections between different market entities. Later iterations show changes based on alterations of the value proposition.

Table 1: Business Model Hypotheses

Business Canvas Section	Hypothesis
Customer Segments	Access to accurate market information is inconsistent between farmers, transporters, and buyers of food (users of market information).
Customer Segments	Users of market information want to improve efficiency and make more money for their work and goods.
Value Proposition	Users of market information want to adopt and see value in communications technology.
Revenue Streams	Users of market information are willing to pay monthly subscription/membership fees to join the member association.
Key Activities	A means of communication is accessible to all people in the area.

3. VALIDATING THE HYPOTHESES

An interview process is overwhelmingly suggested as the method to test the customer sections of the business canvas. From a development project perspective, this is where the community participation occurs and the local perspective on a specific project or product can be determined. Interview questions are derived from the hypotheses. Responses recorded can be counted to either validate or disprove each hypothesis. In the winter of 2013-2104, members of the NapoNet team traveled to Iquitos and communities on the Napo River to interview the entities described in the business canvas. Interviewees included sellers in the Iquitos and Mazán markets, product buyers, transporters, and producers in nine different river communities. Osterwalder advocates at least one hundred interviews in order to prove or disprove an element of the business canvas. More than two hundred interviews were accomplished in this trip.

As cultural appropriateness is of utmost importance in the business system and within customer relations, it was imperative that questions were asked in a comfortable way and as bias free as possible. While bias cannot be eliminated, it was found that the most effective way to find genuine answers was to avoid framing questions. Questions were asked about current practices, with understanding of relative value coming from this information. This also allowed several patterns in data to emerge that were not related to the business system as was initially imagined, but more accurately reflect the value that a real user perceives. A sample of the questions presented to interviewees is presented in Table 2.

Table 2: Interview Questions

Market Entity/Individual	Question
Market Seller	How do prices of the goods sold change over time?
	What influences these changes?
Producer	What goods do you produce?
	If you sell these goods, where do you sell these goods?
	How do you choose to sell goods?
	What, if anything, lacks with the current commerce system?
	Do you use communications technology to organize sales or know prices?
Bulk Buyer	How do you obtain products currently?
	Would you like to purchase directly from the producer?

Data from each interview was recorded via written notes, and then later used in comparison with the hypotheses to determine their validity. Hypotheses were placed in a matrix opposite interviewees, so as to evaluate each interview for its validation or disproval of each hypothesis. This method allows for quantitative data from each interview to be collected. To further remove the potential for subjectivity and bias, three team members performed separate matrix analyses, with the results combined later. Hypotheses can then be eliminated or changed to reflect the data collection, and the interview data can again be used as a comparison in an iterative process. Because the questions were not framed based on the hypotheses, but instead surrounded current practices, it was found that the hypotheses were not all addressed by the data. The data did bring several other ideas to light – ideas that had not been considered, but are included in subsequent versions of the business canvas and value proposition. These ideas are explored in Results and Conclusions.

4. CURRENT RESULTS AND CONCLUSIONS

4.1 HYPOTHESES REVISIONS

Data from the first hypothesis-interview matrix shows very plainly that the original business canvas and hypotheses needed revision. This was the desired overall result, as the initial set undoubtedly contained ideas unsupported by cultural norms. Hypotheses that were absolutely overturned by the data included: 1) communication accessibility, 2) sustainability of alliances with local government agencies, and 3) availability of hardware and software applications. Hypotheses that were mildly disproved regarded: 1) current collaboration between market entities; and 2) accessibility of sufficient hardware and software. Hypotheses related to the initial revenue model of membership and transaction fees were not explicitly overturned by quantitative data, but were definitively disproved from qualitative data. One may notice how hypotheses related to technology dominate the list of disproved hypotheses. This suggests that the validated hypotheses place a greater emphasis on the interpersonal and community components of the model, and that technology is not the true value offered by this model through the NapoNet team. Thus, subsequent hypotheses focus on a human-centric business model which uses technology as a tool rather than an offering.

Hypotheses which were absolutely validated include: 1) inconsistency in access to accurate market information between farmers, transporters, and buyers of food, 2) users of market information want to improve efficiency and make more money for their work and goods, 3) users of market information see value in a membership association which improves profitability, pre-arranges transactions, and aims to improve efficiency, 4) market entities see value in communications technology; and 5) there are no direct competitors in the area at the moment. Again, a finding from these and other hypotheses is that more value is derived from the organization of people who are able to use communications technology, rather than from the distribution of technology itself. This could be due to the topographic and atmospheric conditions affecting the reliability of communication channels, namely the rainforest canopy and weather patterns, but this topic is beyond the scope of this paper. The overwhelming validation of these hypotheses shows that there is a gap in existing practices, presenting an opportunity for the business model presented herein.

Iterations revealed that simpler hypotheses lend themselves to more efficient analysis. The language of the earlier hypotheses presented opportunities for varying interpretations, which subsequently affected the ability to either prove or disprove the hypotheses. This finding enabled later hypotheses to attain a level of clarity and focus previously unseen.

4.2 NEW IDEAS

Since the first revision of the hypotheses and business canvas, the overall idea of a business that would deliver

organization and efficiency remains true. Some key ideas emerged repeatedly in the interviews and are now incorporated into the value proposition. Some trends in the data are presented below, as well as how they were added to the value proposition.

4.2.1 MARKET CERTAINTY

The most obvious trend in the interview data was a mention of a "mercado seguro." Further questions based on this idea showed that "mercado seguro" meant market certainty. Producers find significant value in the idea that prices could be agreed on ahead of time, ensuring that prices would not be as volatile as they are currently experienced. Aside from price stability, producers value the knowledge that there will be someone present that will buy the goods they have grown and then transported. End users value product delivery, and also certainty in the sense that they would have an idea of what products they will receive, and the prices they will pay before the physical transaction occurs. Certainty has become the most important part of the value proposition, wholly driven by the idea that this is what the market entities value.

4.2.2 PROVIDING A CHOICE

Another element of market certainty is the ability for a producer to choose whether or not they travel to sell their goods. It was found in the interviews that producers often feel taken advantage of in market transactions in the city. This was an element of the business organization that had not yet been explored, but could also offer incredible value to the producers. Many of the producers live in communities geographically distanced from the city, and many of these individuals expressed that they did not like visiting the city because it was unfamiliar to them and intimidating. Pre-arranged transactions, communication between market entities, and a membership that would allow them to send goods downriver without ever having to travel to the city themselves would allow them to avoid that fear completely. Again, this is another important component of the value proposition that merits inclusion.

4.3 CONCLUSIONS

One of the most well known aspects of development happens to be that reality does not often follow theory. It has been fascinating to apply development and business theory to a real situation to evaluate its feasibility. Through application of the business canvas model, the NapoNet team has shown that agility in validating hypotheses clarifies how a business approach can provide lasting value to developing communities. It has been shown that input via interviewing methodology allows the NapoNet team to determine the value that can be provided to producers, transporters, and end users in a specific market region in the Peruvian Amazon. Further research will determine the scalability of this type of model to verify if it can be applied to other rural markets with inefficiencies much like the ones described here. This model will continue to be used by the NapoNet team in order to further refine local validation while developing a scalable mindset, with the intention of future implementation for the benefit of communities in the Peruvian Amazon and beyond.

5. ACKNOWLEDGEMENTS

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