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Execution Plan for AGRINET: A Comprehensive Digital solution for Indian Farming Community

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***Abstract*—** In this paper, we have proposed a business plan for AGRINET. AGRINET [10], introduced in our earlier paper is a digital model based on the concept of Internet of Things (IoT), which integrates the already existing technologies, such as mobile communications, Bluetooth, GPS, GSM, CDMA, GPRS, WLAN, Remote sensing, with micro sensors such as - moisture, thermal, level. chemical, light, movement, etc. to help the farmers to perform precision agriculture with minimal extra financial burden. Although earlier also there has been work related to precision farming using remote sensing and GIS, for small farms and dairy farms, but for some technological and financial issues, until recently, the impact of precision agriculture solutions (e.g., variable-rate spraying)— while an improvement over traditional methods—has been limited by the granularity and timeliness of the data the farmers use and their lack of day to-day operational decision support. Very less percent of acreage is managed using the technology due to the high cost of gathering precise field data. It's clear that precision agriculture still has considerable untapped potential. Here, we propose business plan, Financial plan, marketing plan and operational plan for AGRINET not only to improve Indian farmer's financial position but also to meet the food needs of an expanding population.

Keywords- *AGRINET; Internet of Things(IoT); Execution plan: Financial plan; Indian farming; comprehensive solution.*

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I. INTRODUCTION

Today, there are more than 7 billion people on the planet, a figure that's expected to reach 9.6 billion by 2050[1]. By then, the middle class—who typically have more money available for food, leading to greater demand—could reach 5 billion people by 2030[2]. If these numbers hold, overall food production will need to double in a relatively short period of time to meet demand to feed the world's population[3]. The good news is that new digital technologies now make it possible to collect and leverage huge amounts of critical data at minimal costs—thus making a farm's field operations more insight driven, and potentially more productive and efficient. The agriculture ecosystem is already starting to invest in these digital technologies. The total market size for digital-based services, known as "precision agriculture," is expected to grow at a CAGR of 12.2 percent between 2014 and 2020 to reach $4.55 billion[4]. Greater use of precision agriculture services is vital to not only improving a farm's financial performance, but also to meet the food needs of an expanding population. Until recently, the impact of precision agriculture solutions (e.g., variable-rate spraying)— while an improvement over traditional methods—has been limited by the granularity and timeliness of the data they use and their lack of day to-day operational decision support. According to the U.S. Department of Agriculture, over 60 percent of U.S. agricultural input dealers offer some kind of variable-rate-technology services. However, less than 20 percent of acreage is managed using the technology due to the high cost of gathering precise field data[5]. It's clear that precision agriculture still has considerable untapped potential. That's why in the present scenario, one feels the need to use the latest digital technologies such as the Internet of Things (IoT) in agriculture not only to improve farmer's financial position but to meet the food needs of an expanding population.

The **Internet of things** (**IoT**) is the inter-networking of physical devices, vehicles (also referred to as "connected devices" and "smart devices"), buildings, and other items embedded with electronics, software, sensors, actuators, and network connectivity which enable these objects to collect and exchange data[6][7][8]. In 2013 the Global Standards Initiative on Internet of Things (IoT-GSI) defined the IoT as "a global infrastructure for the information society, enabling advanced services by interconnecting (physical and virtual) things based on existing and evolving interoperable information and communication technologies"[8] and for these purposes a "thing" is "an object of the physical world (physical things) or the information world (virtual things), which is capable of being identified and integrated into communication networks"[9]. The IoT allows objects to be sensed or controlled remotely across existing network infrastructure, creating opportunities for more direct integration of the physical world into computer-based systems, and resulting in improved efficiency, accuracy and economic benefit in addition to reduced human intervention. Experts estimate that the IoT will consist of about 50 billion objects by 2020. This concept of digitized globalization is expanding in multiple dimensions of the world community, examples of which are - smart cities, power sector, health sector, etc. But unfortunately, not much work has been done till now, using the concept of IoT, in the area of Agriculture.

In Indian scenario, the biggest problem that is facing Indian farmer today is the ability to get the information regarding the crops and ability to get information regarding best price that he can get for his produce. The information revolution that is supposedly sweeping many areas of Indian society has left the Indian farmer almost untouched and his life has not changed much in last 10 year. Although earlier also there has been work related to precision farming using remote sensing and GIS, for small farms and dairy farms, but for some technological and financial issues, until recently, the impact of precision agriculture solutions (e.g., variable-rate spraying)— while an improvement over traditional methods—has been limited by the granularity and timeliness of the data the farmers use and their lack of day to-day operational decision support. Very less percent of acreage is managed using the technology due to the

high cost of gathering precise field data. It's clear that precision agriculture still has considerable untapped potential.

Hence in our earlier paper[10], we proposd AGRINET. AGRINET is a digital model based on the concept of Internet of Things (IoT), which integrates the already existing technologies, such as mobile communications, Bluetooth, GPS, GSM, CDMA, GPRS, WLAN, Remote sensing, with micro sensors such as - moisture, thermal, level. chemical, light, movement, etc. to help the farmers to perform precision agriculture with minimal extra financial burden. Consecutively, **in the present paper**, we propose business plan, Financial plan, marketing plan and operational plan for AGRINET not only to improve Indian farmer's financial position but also to meet the food needs of an expanding population. It plans to bring real information revolution to the target market, i.e. Indian farmers, and help them take more informed decisions to maximize their profits.

II. THE CONCEPT[10]

India's approximately 20 million-line telephone network is one of the largest in the world and the 3rd largest among emerging economies. Still the telephone penetration rate in India is abysmally low (as low as 2.2 per 100 people of population by some estimates). This penetration rate is way below the global average. India has one of the fastest growing telecommunication networks in the world with system size (total connections) growing at an average of more than 20 percent over the last 4 years. Still one group of population that is seemingly completely left out of this growth is the rural population. Significant growth in last some years has come by way of mobile telephony which is best suited for taking the telecom networks to rural India. Still one feels that just providing voice services to rural population may not do enough to motivate them to get a telephone connection.

Looking at the primary occupation of rural population (agriculture) and lack of advanced information available that can help them perform their job better, this paper proposes to provide agricultural knowledge products tied with relevant service models that would provide a value preposition for rural market. The value preposition thus offered would motivate a sizable number from the rural population to opt for this service and would result in increased sales of mobile phones to that market. This would also establish an entirely new business line providing for technology solutions in agriculture and related areas.

This product intends to leverage the existing available technology to provide a solution that can be used for the above purpose. The product would use following already existing technologies and integrated them to provide this product and service. Technologies that would be incorporated in this product and service are as following:

- Mobile phone technology
- GSM
- CDMA
- GPRS
- CDMA Data
- WLAN
- Bluetooth
- Customer Relationship Management
- Global Positioning System
- Remote sensing.
- Micro Sensors
    - Thermal Sensors
    - Chemical Sensors
    - Level Sensors
    - Moisture Sensors
    - Light Sensors
    - Movement Sensors

There have been studies and position papers written on application of remote sensing technology in precision farming and need for precision farming itself [6]. There also have been studies of using GIS in small farms and dairy farms[7]. Both these technologies, remote sensing and GIS, can be effectively used in providing information related to yield, forecasts etc to farmers.

A. Target Market

The target for this product is the middle to large farmer who is educated to some level and appreciates new technologies. Such farmer generally has access to television and is not averse to using technology in farming. The farmer is also willing to change his crop pattern based on the inputs provided that would maximize his returns. In India the farmers have been classified in following categories. Over the years, land holding in India is getting more and more fragmented.

Table 1 in Ref[10], shows the market size in numbers. As we can see from the table, if we choose farmers in category of medium to large we could target approximately 10 million[1] farmers[3].

B. Classification

This product and associated service require development and integration of technologies in a form that can be sold and deployed. At the same time there is a high degree of dependence on other components of the value chain and they need to buy into the idea.

Business value chain: Being a product and service offering, quite a few players are involved in the value chain of the business as shown in Fig. II. Following are some of the candidates in the value chain:

1) Agricultural pricing information provider – This could be hundreds of markets across the country or a single information provider like Government of India [4]. In any case we would have to have some information agreement with them.

2) Meteorological information providers - These are agencies that collect meteorological information, analyze the information and provide relevant information in a fashion so that it is ready for dissemination to the end customer.

3) Agriculture research information provider - This could be research institutions across the country, who based on the meteorological information, provide some kind of forecast regarding crop pattern for next harvesting season. These agencies should also provide remedies in case of serious meteorological events.

4) Raw material Provider - These are agencies that could receive the order for agricultural raw materials and dispatch the order to the villages. The dispatches need not be of urgent nature but need to be scheduled and sent to the doorstep of customer.

5) Application service provider - This is the main hub of the business, it would gather all the information and send the information to the relevant entities in the value chain. This entity would also be the front-end for the complete business.

6) Equipment Provider -The Company would provide equipment (sensors, mobile phones, applications etc) to the ASP which would be the prime contact for sale of this equipment.

III. FINANCIAL PLAN

The business would be represented by the entity called "Application Service provider". The ASP would enter into agreements with all other entities and provide the product and service.

A. *Players Involved*

As depicted in Fig. III, following players are involved in this business: 1) Application service provider (ASP) is the front end for the business. 2) Application and equipment provider – 3) Raw material provider 4) Research, Meteorological information provider 5) Marketing and trading interface – Technology Involved

The technologies involved in the product would be:

- Available mobile devices
- WAP Standards
- Mobile Networks
- Existing telecom and computer networks
- Micro sensor technology
- GPS
- GIS
- Remote sensing.

B. *Industry*

This product and service does not belong to a single existing industry but is a combination of agricultural, rural marketing, and telecommunication industry. The analysis of the industry is shown in Fig. IV. As we can see this business belongs to a nascent (more like non-existent) industry. There has not been much innovation in the way the agriculture supply chain business is working. The main issue in this industry is the correct pricing of the product and service because the buyer is very price sensitive.

C. *Financial Plan*

As the Fig. V shows, the venture can be developed in a phased manner with the control being with different entities during different phases.

1) *Phase 1*: During the phase 1 of development, the company would be developing the technology and be creating the final offering. This phase would be completely owned and financed by the company and no external entity would be involved. this phase would also result in setting up of the venture team.

2) *Phase 2*: This phase would also be completely financed by the company. This phase required the company to go out and identify the partners and alliances. Application Service Providers (ASPs) would be identified for different markets and contracts would be signed with them. These ASPs could be existing business or new entrepreneurs.

3) *Phase 3*: Phase 3 would allow the ASPs to take charge. the business would be financed by them from this point onward with the company providing support. The ASPS would need to undertake following activities before the test marketing could start.Enter into agreements from research agencies, raw material providers, logistics providers etc. Establish the supply chain and marketing and trading links to mandis. Identify the test market segment and have test marketing agreement in place.

4) *Phase 4*: This phase would see the business come alive with a full blown launch. by this time the ASP will have taken complete control of business and the company will be with it only to provide equipment and technology. Unless the company has any equity partnership with ASP, from this time onwards it will operate in an independent manner.

IV. OPERATIONAL PLAN

As discussed in different phases the controlling partner in the business would be a different entity. In this section we will discuss the first two phases because after that the business is launched as an independent entity and it goes out of control of the company. The company needs to create a venture team that would be responsible for creation and launch of the business. The team needs to be consisting of following resources.

- Marketing teams – This team's primary job is to sell the venture idea to ASPs and get a signup from them.
- Technology team – This team's primary job is to create the product and solution and make it ready for deployment
- Customer support team – This team's primary responsibility would be to provide support related to developed technology
- Venture management team – This team's primary responsibility would be to manage the venture through the transition to ASPs.
- Senior management sponsor – A senior management sponsor is needed that can hand-hold this venture through different phases till the time it is an independent business.

V. MARKETING PLAN

The venture needs to be markets to ASPs with a clear value preposition for them. If it is possible, initially a equity partnership can be entered into which will be divested once it is successful. The venture can also be marketed to players like e-Choupal which would become our alliance partners and provide complementary services. The marketing team would initially sign-up some ASPs and then could promote the venture through Agri-Fairs that are organized by different agencies where large number of farmers visit.

Competitors like e-Choupal are not following this path for business because even though businesses look similar in first instance, there is significant different in the main motivation of the stakeholders. ITC is doing e-Coupal for brand building and buying agri-products from source, while the company's motivation is to increase the sales of its technological products. Hence we are proposing a different path. Also with e-Choupal business, there is likelihood of the gram-sanchalak becoming a power base on its own, our model provides the power of information directly to each farmer.

VI. ASSESSMENT OF RISKS

This venture has inherent risks that may make it unviable at different points in its life cycle. The risks are identified below along with their assessment and any action to be taken to circumvent that risk.

- The technologies involved, although not very new, have not been integrated in past at this scale. This integration itself may prove very challenging and at times very risky. We need to prototype quickly and often to retire the risk of technology from the venture.
- The business depends on the successful alliances with different stake holders. We need to define clear value preposition in revenue and profit terms for these stake holders so that they are fully bought into the venture. The ASP also needs to be provided with very clear value preposition from the venture.
- The logistics of running this business are very complicated. Too many agencies need to be coordinated for it to work efficiently. This needs to be kept in mind while identifying the ASP who would actually run the venture.
- The involvement of the company itself may be biggest risk. The company may not be willing to be too involved in the business but the best way to provide respectability to the business would be the involvement of the company or at least equity partnership with ASPs in initial phases of the operation.
- If we could not enter into partnership with players like e-Choupal, they may retaliate. Since they already have some market in certain regions, it may be prudent to start our venture in different market segments and then move into segments where they are already present.

VII. Future Development

The current strategy is to get a business off the ground and the company would benefit by increased sales of its equipment while other stakeholders will get benefited by the service offering. In longer term, this can become a serious business. The business, if successful, would provide the company inroads into the life sciences business by leveraging its existing business and new technologies. This itself could become a revenue earner of a significant size in longer term.

Venture value preposition to the company

The company, also called Application Service Provider (ASP) here, needs to take up this venture for following reasons. The venture would give the company complete monopolistic hold over rural market which with very pessimistic estimates is at least 10 million large. The market, once captured for mobile devices would exist for the company to deploy other products e.g. set top boxes for cable, security systems. Would considerably help the company's foray into life sciences with available test market. Would also provide social benefits.

Expected organizational issues

Since the venture is supposed to bring most of the value to organization initially in indirect fashion, it may be difficult to convince conventional marketing groups to take it up. Hence it is envisaged to take it up as a technology demonstrator and engage external service providers to do most of the marketing job.

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VIII. Conclusions

In this paper, we have proposed an execution plan for AGRINET. AGRINET [10] is a concept introduced in earlier paper, which integrates the already existing technologies, such as mobile communications, Bluetooth, GPS, GSM, CDMA, GPRS, WLAN, Remote sensing, with micro sensors such as - moisture, thermal, level. chemical, light, movement, etc. to help the Indian farmers to perform precision agriculture with minimal extra financial burden. Although earlier also there has been work related to precision farming using remote sensing and GIS, for small farms and dairy farms, but for some technological and financial issues, until recently, the impact of precision agriculture solutions (e.g., variable-rate spraying)—while an improvement over traditional methods—has been limited by the granularity and timeliness of the data they use and their lack of day to-day operational decision support. Very less percent of acreage is managed using the technology due to the high cost of gathering precise field data[5]. It's clear that precision agriculture still has considerable untapped potential. Hence, in the present paper, using the concept of Internet of Things (IoT) in agriculture, we propose business plan for AGRINET to improve farmer's financial position and to meet the food needs of an expanding population.

If we look at the strengths, weaknesses, of the company in doing this business and opportunities and threats that the company faces if it decides to do this business, they are:

- **Strengths**: The biggest strength of the company is its innovation in technology and existing relationships with operators and application service providers.
- **Weaknesses**: The biggest weakness of the company is its probable unwillingness to get involved in actual running of the proposed business. If the company gets involved, it would provide credibility and respectability to the business.
- **Opportunities**: There is a large market that is not using mobile phone technologies because voice is not good enough value for them to buy a mobile phone. If applications are provided to them that are pertinent to their business, it may lead to explosive growth in mobile sector. If we develop this business we can get an exclusive access to this market.
- **Threats**: Biggest threat is the threat of others doing it if we do not move fast enough.

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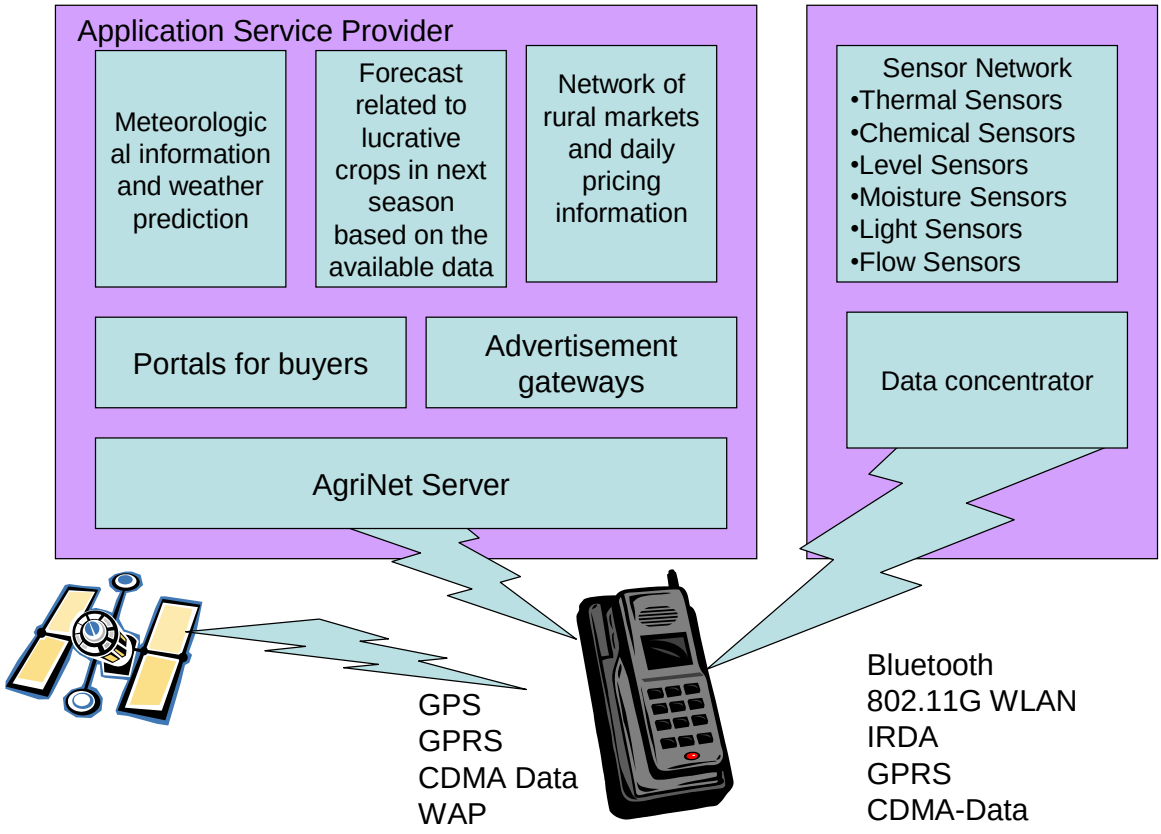

Figure 1. The Basic Concept of AGRINET .

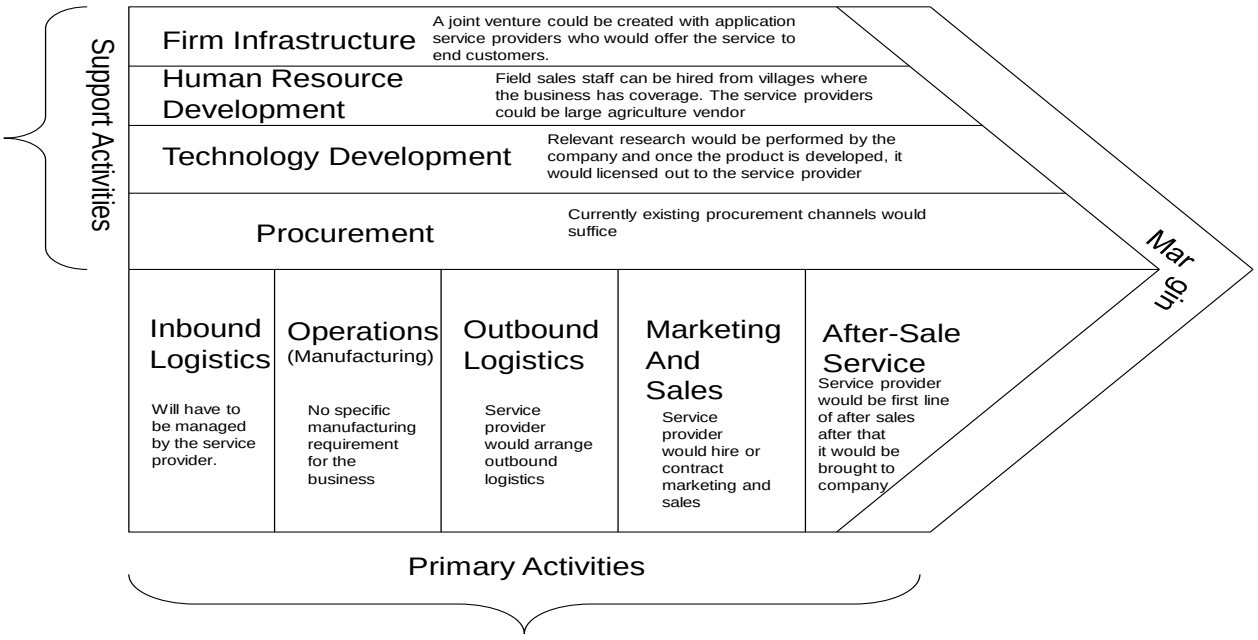

Figure 2. Business Value Chain.

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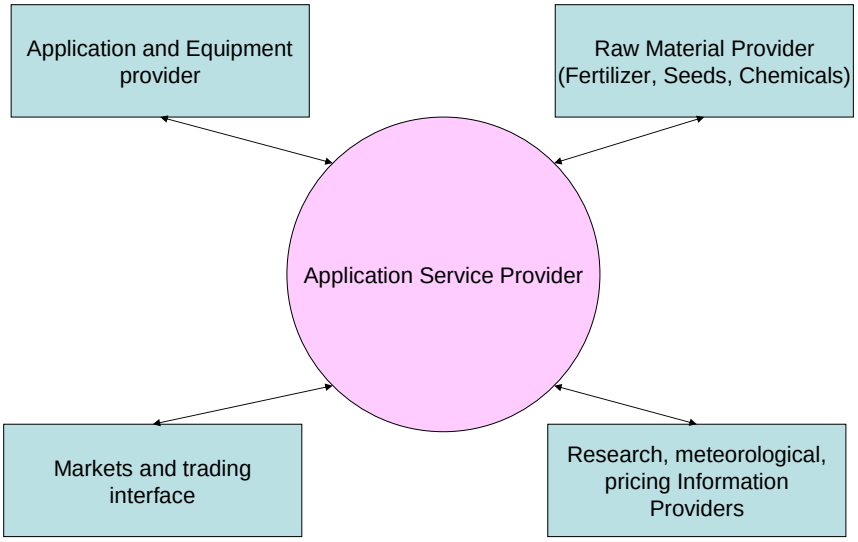

Figure 3. Application Service Provider.

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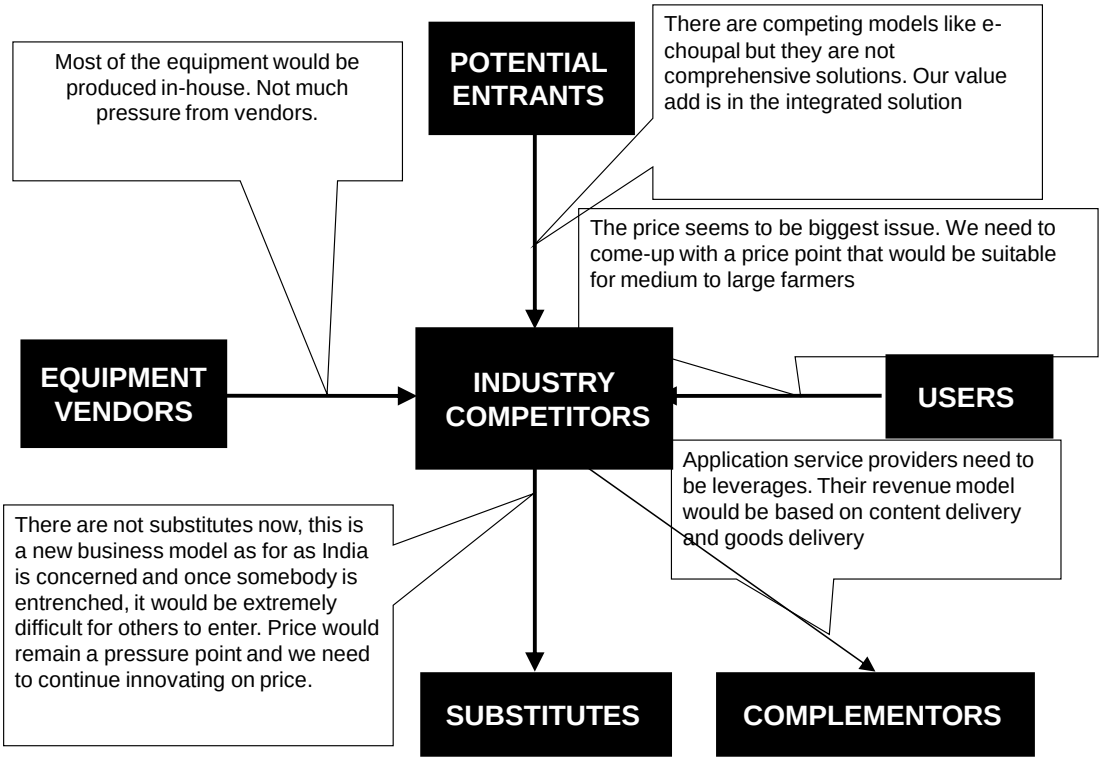

Figure 4. The Industry.

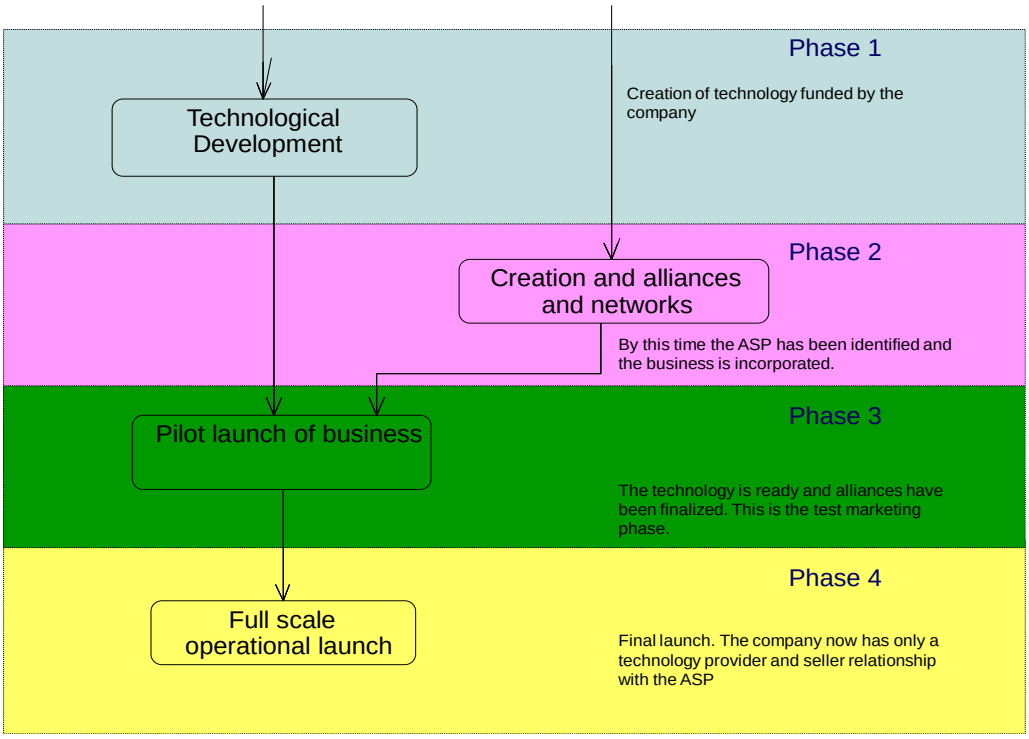

Figure 5. E Financial Plan: Venture Development Phases.

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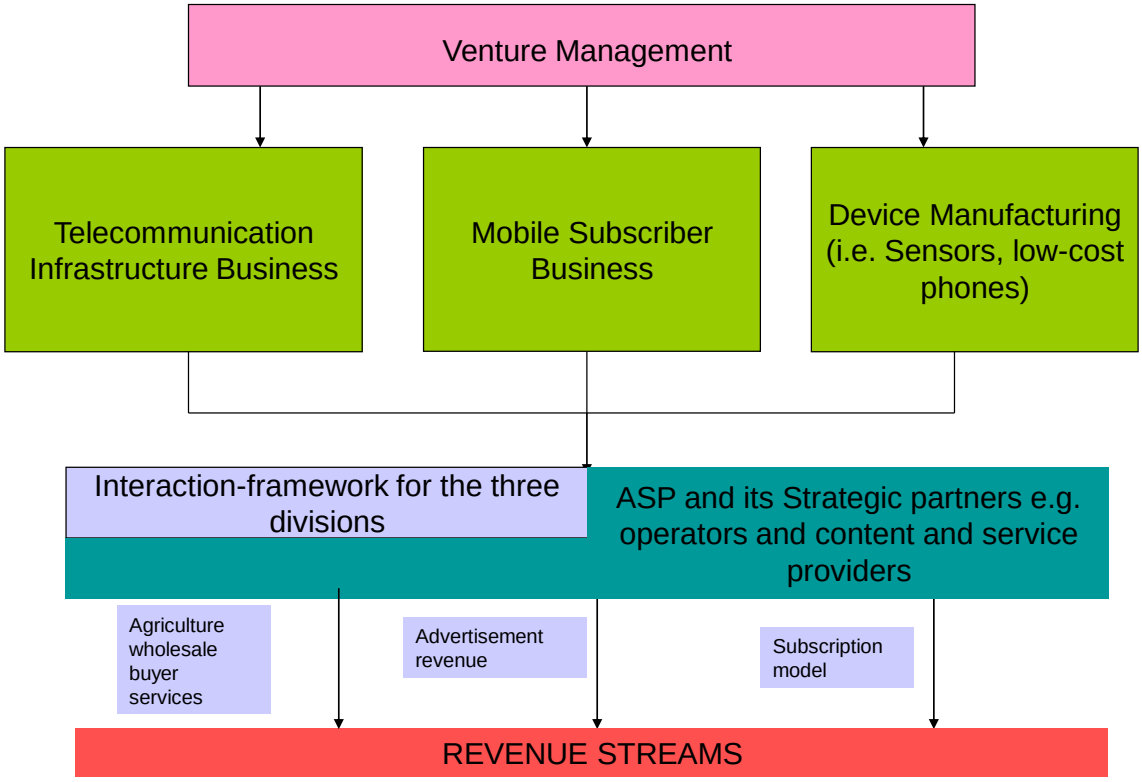

Figure 6. Operational Plan.