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Techno Economic Analysis of Interconnected Digital Home Networks

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Problem Description

This thesis aims at making a Techno Economic analysis of I-Box, within the Interconnected Digital Home Networks project InHoNets II. Home networks are a new wave of technology with Homes as the new frontier for Internet based services. With home-to-home services getting more popular which can include for example, sharing of family photos and videos, music, games, and popular TV-programs on a digital recorder. To make this work easily, we would need a simple way to introduce the inter-home functionality into existing home network installations. The crux of this InHoNets II Project under which a part is my thesis is the I-Box itself, which is a standalone simple and inexpensive device that can be bought from a nearby retail store, and plugging an Ethernet cable into the device, and after some very simple configuration (or perhaps with no configuration at all), other home networks and their services, based on the user's contacts, become visible. This thesis aims at giving a technical overview of I-Box technology and to analyze the various scenarios for the deployment of the I-Box by using popular theoretical frameworks and business models that drive its deployment.

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Supervisor: Svein Johan Knapskog, ITEM

ABSTRACT

A home network is a popular method of allowing computers to communicate with each other within a given residential area or a local area network. Homes are the new frontiers of technology in the current global scenario, a digital interconnected home network is a reality and an efficient means to exchange information seamlessly across different homes and across different geographies is the need of the hour. The interconnection of different homes is possible with the existing ADSL subscriptions but would need changes in the existing gateway structures, which could be challenging for the less techno-savvy. In an effort to make life easier for the end user and help making the interconnection between various home networks seamless, a small device called I-Box is introduced through this project, which is essentially a small UPnP device with rich features and functionalities.

This thesis gives an overview of the I-Box technology and with the help of various popular theoretical frameworks and concepts, investigates available Marketing channels and suggests a suitable deployment strategy for the I-Box by making a comparative study of the various possible scenarios and thereby identifying the most suitable model for its deployment.

1. INTRODUCTION

1.1 Motivation

A home network is a popular method of allowing computers to communicate with each other within a given residential area or a local area network. Home networks were previously restricted to the technically savvy, earlier many families didn't have more than one device or they could not afford one, but now, with the advent of technology at an affordable price, many families have started using computers not just to check e-mails but also for shopping, downloading videos, games etc and in such a scenario, the concept of Home network arises.

To realize the shared internet connections such as exchanging digital media content, interconnection of various devices and to bridge them to each other makes the sharing easier, which is a reality, thanks to the Home networks. Low cost computers, fiber optics, and multimedia capabilities have further advanced the concept of home automation systems into one that integrates data, voice, and visual communications inside the house [41]. A key element in a home network is the Home server itself, which is typically a PC or other computing device, connected to a home network that provides services to other devices in the household.

An interest towards automating homes, leads to a new view for the future home, a new life style with new services and applications [32]. Definitely, Homes are the new frontier of technology in the current global scenario. A digital interconnected home network is a reality and an efficient means to exchange information seamlessly across different homes across different geographies is the need of the hour. The interconnection of different homes is possible with the existing ADSL subscriptions but would need changes in the existing gateway structures, which could be challenging for the less techno-savvy. In an effort to make life easier for the end user and help making the interconnection between various home networks seamless, a small device called *I-Box* is introduced through this project, which is essentially a small UPnP device with rich features and functionalities [6].

This emergence of improvements in the digital homes sphere brings with it growing opportunities for hardware vendors, software firms and various kinds of service providers as well. New device categories emerge and home users update their old device configurations into the digital age. Typical digital home devices include computers, music players, digital cameras, and other home entertainment systems that are able to connect to the Internet and communicate with each other through a home network. Such an example of an improved device is the I-Box which would be discussed in detail in this thesis.

1.2 Goal

Broadly, there are two goals of this thesis, Firstly, giving an overview of I-Box and the technology involved and Secondly, and perhaps more importantly, investigate the available Marketing channels and deployment strategies for the I-Box and make a comparative study of the possible scenarios, by analyzing various permutations for I- Box with the help of different business models and finally, identifying the most suitable model for its deployment.

1.3 Scope

This thesis starts by giving an overview of the Home Networking technology. Further, a background study on both technology and business models along with the popular frameworks used is done, while keeping the Marketing channel deployment strategies for I-Box as the main area of focus.

1.4 Methods Used

In this thesis, the following methods were used:

- a. Literature Survey

- b. Theoretical Frameworks
- c. SWOT and Axiomatic table based analysis [40]

For the Technical section, a mix of literature survey on existing Home Network technology, published journal papers and company white papers were used.

While for the Business section, the following Frameworks and methods was used:

- a. Marketing Channels [39]
- b. Porter's 5 forces framework [13,14,15,17,18]
- c. Value chain and Value Nets [8, 43]

1.5 Structure

This thesis is divided into seven sections:

1. Introduction:

In this section, the Motivation, Goal, Scope, Methods employed and the structure of the thesis is discussed.

2. Background:

This section is divided into Technical and Business literature review. Within the Technical literature review, Home Network, a market survey on Home networks in Europe and the UPnP technology is done, while in the Business literature review, related concepts like Business Models, Porter's 5 Forces, Value Net, Value Chain analysis and Kotler's Marketing Channels is discussed.

3. I-Box Technology:

In this section, detailed information on I-Box technology, its functions and features is given. Later, an overview of the InHoNets project and a simple use case is discussed.

4. Deployment Scenarios:

In this section, the scenario construction process and a detailed description of each possible Deployment scenarios is done.

5. Analysis:

In this section, to start with, an end user analysis and the pricing analysis for the I-Box are done. Later, an Analysis framework is proposed and the two major analysis methodologies employed, SWOT analysis and the Axiomatic Table analysis approach are discussed.

6. Result:

In this section, the results of the SWOT and Axiomatic analysis are discussed.

7. Conclusion:

In this section, a Summary of the work done, an evaluation of the study and some possible areas for future work is presented.

Figure 1 gives an overview of the Thesis with the help of a flowchart.

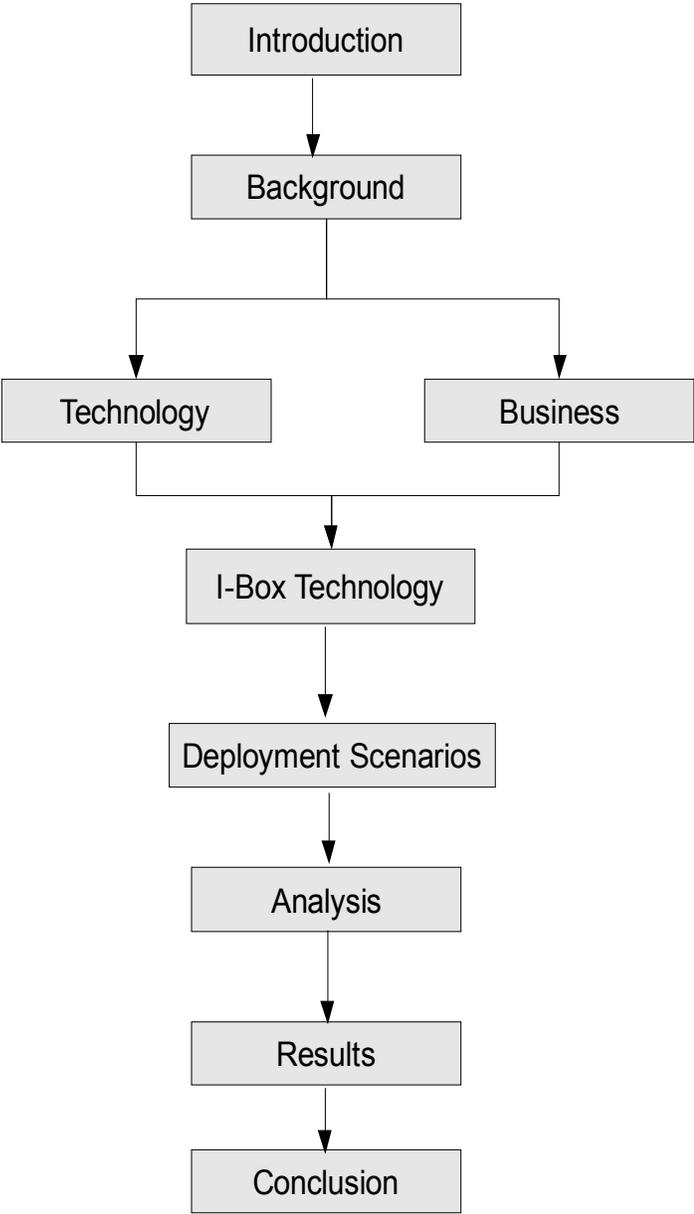


Figure 1: Structure of the Thesis

2. BACKGROUND

This section is broadly divided into two parts, Technical and Business. In the first section, a literature review on Home Networks along with a case study on the Home Network growth in Europe is done. Later an overview of the UPnP technology which is used in the I-Box is done. The second section discusses more about the Business Models, the five forces model, Value net and value chain analysis, and finally, a study on the Kotler's marketing channels.

2.1 TECHNICAL LITERATURE REVIEW

2.1.1 Home Networks

A home network system is a collection of networked home appliances, which are considered to be distributed embedded systems that are connected by networks. A home network system consist of various networked home appliances and a home server system which allows the devices to communicate with each other and share a common interface [27, 28]. Home network systems must have an automatic configuration that allows devices to join and leave the network, and to learn about other networked home appliances [31, 32].

In addition, home network systems should enable pervasive peer-to-peer network connectivity of networked home appliances for distributed and open communication [29]. The popularity of home networks has been steadily growing for several years now. This is partly a result from the increasing number of computers per household, but the true spark has been the success of wireless technologies such as the Wireless Local Area Network (WLAN) and Bluetooth. The convenience of intra-home mobility and becoming detached from wired networks have definitely improved the home networking user experience [26].

Clearly, Home networks are a new wave of technology and are a new frontier for Internet-based services as Home-to-Home services are getting more popular which can

include for example, sharing of family photos and videos, music, games, and popular TV-programs on say, a digital recorder. The digital entertainment devices available on the market already include network connectivity through Ethernet. When these devices are connected to a home broadband Internet service, and standardized protocols are run to find services, we open a totally new area for services. The Figure 2 illustrates a typical Home Network system.

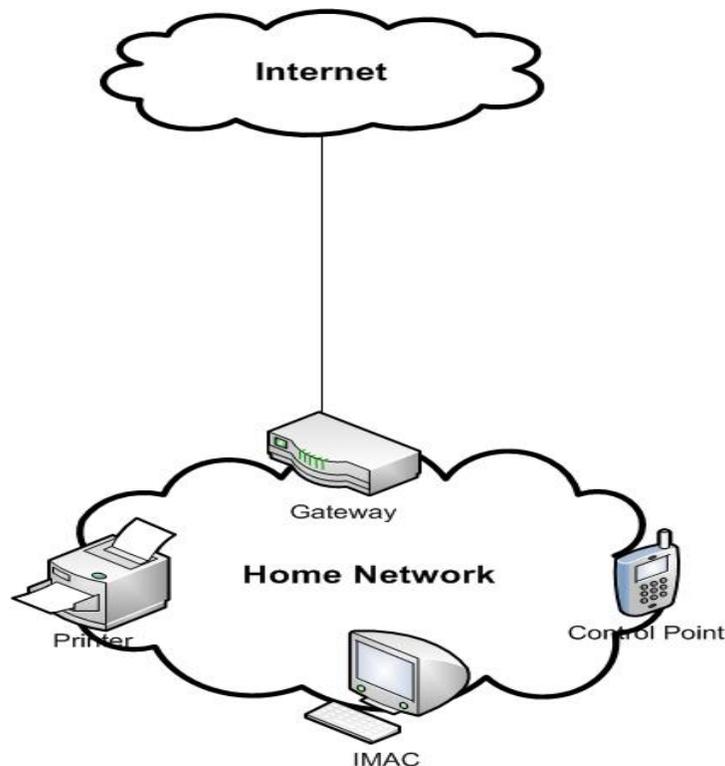


Figure 2: An example of a Home Network

In such system, Printers can be shared as well across homes, surveillance of homes can be done between families and homes can also offer rich features like remote backup for family memories to ensure that the pictures are stored in digital formats. There are many Internet-based services already today to fulfill these expectations. Yet, they are quite

cumbersome to use and limited in functionality which means users must register to a number of different services.

2.1.2 Home Networks in Europe – A survey

According to Park Associates, in their white paper titled “Europe: Home Network Update”, they discuss that the number of households with data networking solutions is expected to grow from 114 million at the end of 2006 to exceed 160 million by year end of 2012, with Europe’s share growing faster than both North America and even Asia Pacific. Further, they also claim that overall Europe will lead both the North American and the Asia Pacific markets in terms of home networks provided and deployed by broadband and triple play service providers.

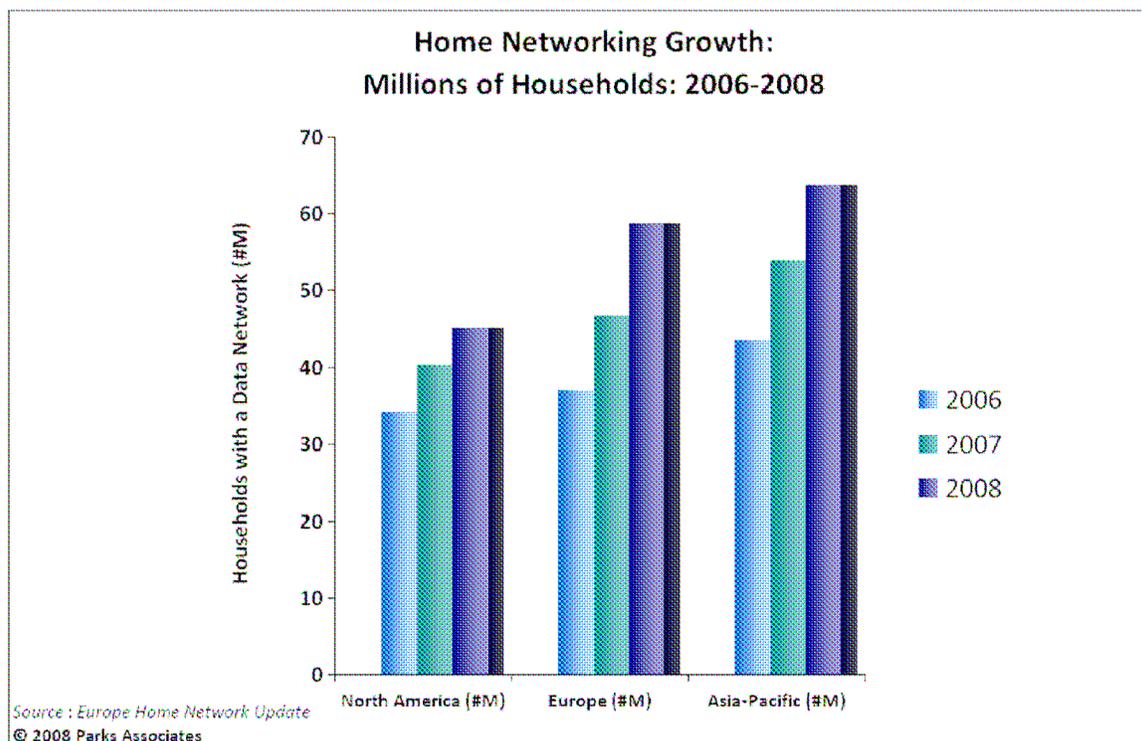


Figure 3: Home Network Growth in Europe [38]

The Figure 3 above illustrates the growth in the Home Networking technology over a period of three years (2006 – 2008), in different continents like North America, Europe and Asia Pacific.

Europe’s Home Networking Growth

The following graph as shown in Figure 4 gives an overview of the Home Network growth in a select few countries within Europe.

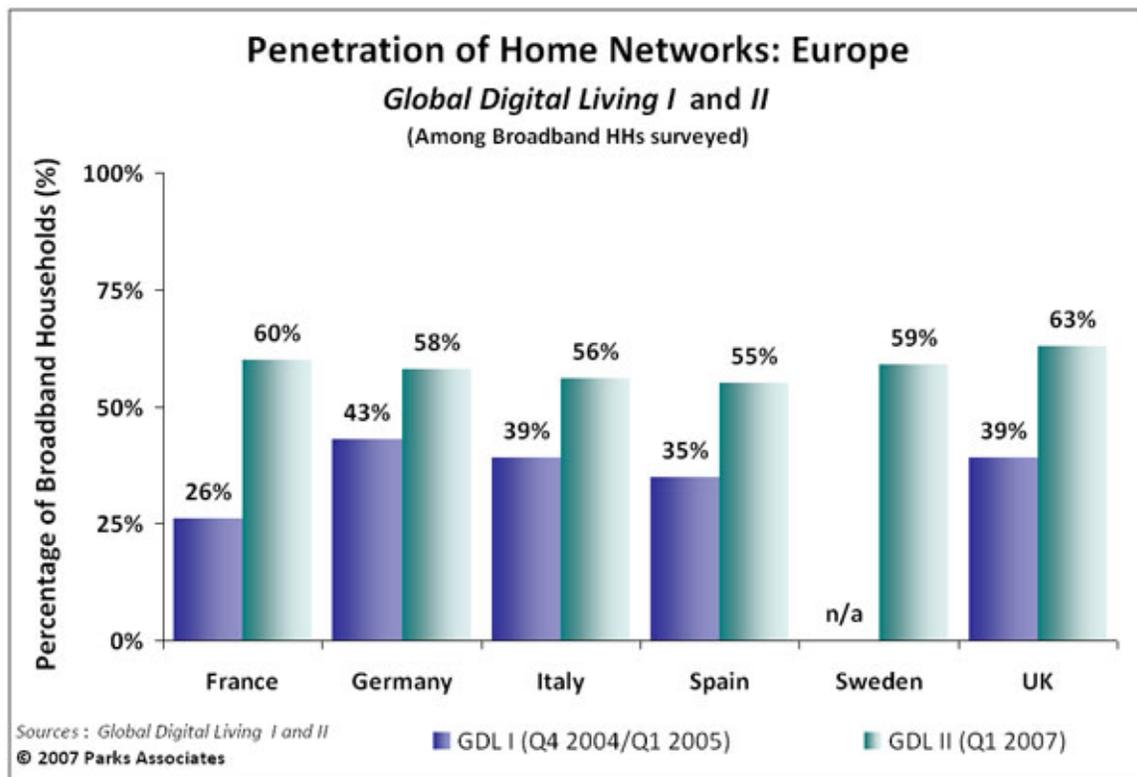


Figure 4: Penetration of Home Networks in Europe [38]

Europe is experiencing growing home networking technology awareness which could partly be attributed to an increasingly competitive market for broadband services. France and the U.K. have been at the leading edge till now, and Germany, Spain, and Italy have been slowly catching up as well. According to the paper published, the latter three

markets could keep the momentum going, however, provided that regulators foster greater competition in this growing area.

2.1.3 Overview of UPnP Technology

With the world of specialized information appliances all set to take over the ever changing technology landscape in the coming years, the coordination between devices has become a serious research issue. In fact, quite a number of architectures addressing mobile and specialized devices have emerged recently. These architectures are essentially coordination frameworks that propose certain methodologies and means of device communication with a broader aim of simple, seamless and scalable device interoperability [19, 20].

UPnP may be defined as a Distributed, open networking architecture that employs TCP/IP and other common Internet technologies to enable seamless proximity networking, in addition to control and data transfer among networked devices in the home, office, and public spaces [21, 24]. Universal Plug and Play (UPnP) is a set of protocols for automatic service discovery in a Local Area Network (LAN) [25]. This technology is more suitable for home networking environments, where for example a consumer can buy a new device; plug it into the network and the device itself automatically configures in order to access the resources of the network [35].

Advantages of using UPnP

One of the most important features of I-Box is its UPnP capabilities. In this technology, device coordination essentially means providing a subset of the following capabilities to a device:

- Self configuration without (or minimal) administrative intervention.
- Most prominently, its ability to automatically announce its presence to the network and thereby discovery of devices in the neighborhood and even those located remotely.

- Ability to describe its capabilities as well as query/understand the capabilities of other devices.
- Seamless inter-operability with other devices wherever meaningful can be obtained as well [29].

2.2 BUSINESS LITERATURE REVIEW

This section gives a theoretical background on what is a business model and its role amidst Technology and Economics domains. Further, it also discusses the various popular theoretical business frameworks and finally, a detailed study on the Marketing and distribution channels as proposed by Kotler.

2.2.1 Business Models

According to Osterwalder, Pigneur and Tucci at Harvard Business School, a Business Model may be defined as a conceptual tool that contains a big set of elements and their relationships and allows expressing the business logic of a specific firm. It is a description of the value a company offers to one or several segments of customers and of the architecture of the firm and its network of partners for creating, marketing, and delivering this value and relationship capital, to generate profitable and sustainable revenue streams[33].

Another possible definition of a Business model in the context of Mobile Technology based design could be that it essentially describes how to extract value from a mobile service innovation.

- It converts new technology to economic value (essentially it is economic utility for customers)
- The business plan with which the company intends to generate revenues and profits taking into account the dynamics of various related value system(s) [7].

Thus in this regard, to extract value from an innovation or a new technology, the established companies or even a new start-up need an appropriate and feasible business model. Business models convert new technology to economic value. For some niche area start-ups, familiar business models cannot be applied, so a new model must be devised. Not only is the business model important, in some cases the innovation rests not in the product or service but in the business model itself [16].

In their paper “The Role of the Business Model in Capturing Value from Innovation”, the authors Henry Chesbrough and Richard S. Rosenbloom present a basic framework describing the elements of a business model. Given the complexities of products, markets, and the environment in which a firm operates, it could be difficult to fully understand the organization's tasks in their entirety. The technical experts know their domain and the business experts are good at their field [10]. The business model serves to connect these two domains, which is illustrated in Figure 5.

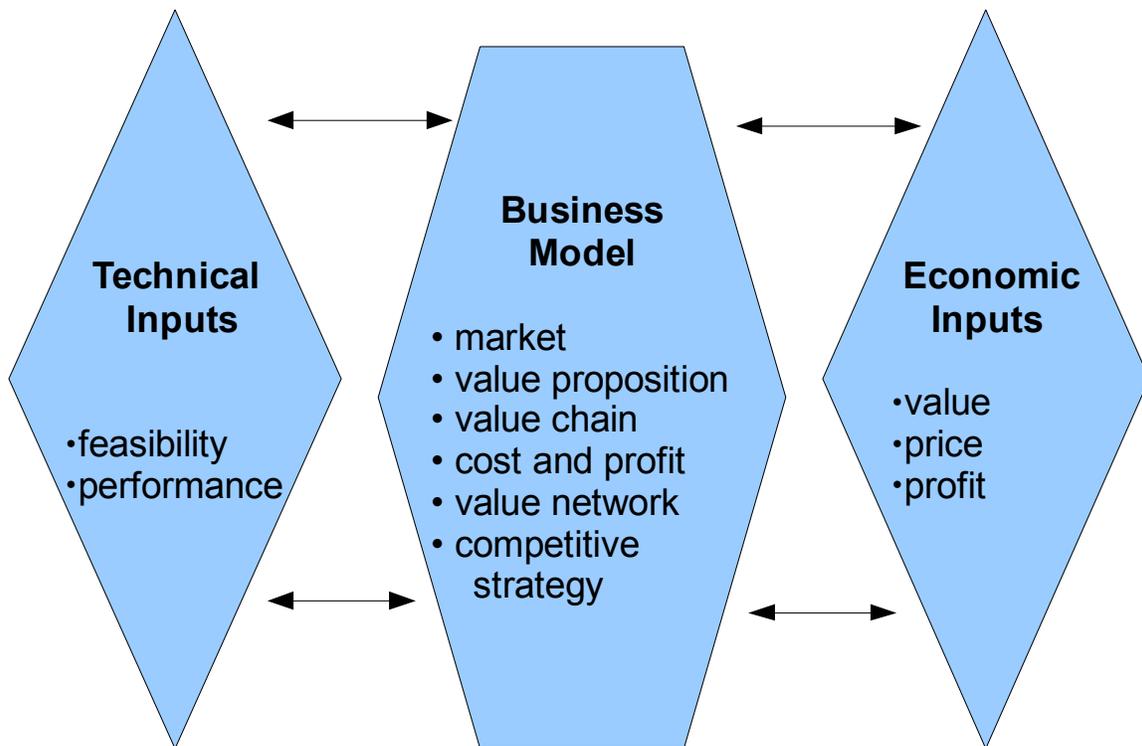


Figure 5: Business Model Mediation between Technical and Economic Domains

A business model draws on a multitude of business subjects and in most cases also includes economics, entrepreneurship, finance, marketing, operations, and strategy. The business model itself is an important determinant of the profits to be made from an innovation. It is a known fact that a mediocre innovation with a great business model may be more profitable than a great innovation with a mediocre business model.

In their research, Chesbrough and Rosenbloom searched literature from both the academic and the business press and identified some common themes. They list the following six components of the business model:

Market segment: It is important to recognize that different market segments have different needs, and target a group of customers accordingly. While it is also true that potential of an innovation is achieved only when a different market segment is targeted.

Value proposition: Giving a description of the customer problem, the product that tries to address the given problem, and from a customer's perspective what value that product would generate.

Value chain structure: The Company's position and activities in the value chain and how the firm will effectively capture part of the value that it creates in the chain.

Margins and Revenue generation: It is basically about how are the cost structures and the revenue generation methods.

Position in value network: Identifying the complementors and key competitors which can be important in utilizing in a better way in order to deliver value to the end customer.

Competitive Strategy: The means employed to develop a clear competitive advantage for a company by employing various strategies like product differentiation, innovation etc [34].

In this thesis, we employ various Business models and scenarios to explore various possible deployment strategies concerning the I-Box.

2.2.2 The Five Forces Model

This concept was proposed by Michael Porter, who provided a framework that models an industry as being influenced by five forces. Michael Porter identified five different competitive forces that shape every single industry and market. A strategic business manager seeking to develop an edge over rival firms can use this model to better understand the industry context in which the firm operates which is discussed as follows:

- Threat of New Entrants, the possible threat by entry of new competitors.
- Power of Suppliers, the bargaining power of suppliers.
- Power of Buyers, the bargaining power of buyers.
- Availability of Substitutes, the possible threat of substitute products.
- Competitive rivalry, the rivalry amongst the competing firms [13, 14, 15, 17, 18].

Availability of Substitutes: The Threat of Substitute Products

In Porter's 5 forces model, substitute products refer to products which exist in other industries. The existence of close substitute products increases the propensity of customers to switch to alternatives in response to price increases. To the economist, a threat of substitutes exists when a product's demand is affected by the price change of a substitute product. A product's price elasticity is affected by substitute products; this is because as more substitutes become available, the demand becomes more elastic as the customers have wider choice of alternatives. A close substitute product constrains the ability of firms in an industry to raise prices. Thus in a nut shell, the following factors could be important:

- A Customer's propensity to substitute and also the relative price performance of substitute products.
- The perceived level of product differentiation.

Threat of New Entrants: The Threat of the entry of new Competitors

Profitable markets that yield high returns will draw firms. The result is many new entrants, which will effectively decrease profitability. Unless the entry of new firms can be blocked by incumbents, the profit rate will fall towards a competitive level. It is not only incumbent rivals that pose a threat to firms in an industry; the possibility that new firms may enter the industry also affects competition.

While in theory, any firm should be able to enter and exit a market, and if free entry and exit exists, then profits always should be nominal. In reality, however, industries possess characteristics that protect the high profit levels of firms in the market and inhibit additional rivals from entering the market. Thus in a nut shell, the existence of barriers to entry like patents, rights, etc. could be an important force. Other factors which might be of importance could be the economies of product differences and the brand equity of the product itself. The possible switching costs and also the initial capital requirements also have a bearing on this. Means and also the access to distribution and the governmental policies also play an important role here.

Competitive Rivalry: Rivalry amongst the Competing Firms

For most of the existing industries, this is the major determinant of the competitiveness of the industry. Sometimes rivals compete quite aggressively and in different instances they also compete in non-price dimensions such as innovation and marketing, which also do tend to have an impact on the product line. Some of the other important factors could be the number of competitors, the amount of money allocated for advertising, the rate at which the industry grows, while other factors like diversity of competitors, Economies of scale and the Sustainable competitive advantage through improving products and innovation are of equal importance as well.

Power of Buyers: The bargaining power of Buyers

The bargaining power of buyers could also have an important bearing on the product and this factor is also popularly known as the *Market of outputs*. The ability of customers to put the firm under pressure and this includes the customer's sensitivity to price changes. Some of the other factors which could have an impact are The buyer concentration to firm concentration ratio, Possible bargaining leverage, the buyer volume is also an important factor, The amount of information available with the buyer and also the switching costs relative to firm switching costs. Other important factors are the availability of existing substitute products and the buyer price sensitivity which means that the customer's are sensitive to increase in price of a product.

Power of Suppliers: The bargaining power of Suppliers

This is also described as market of inputs. Suppliers of raw materials, components, and services (such as expertise) to the firm can be a source of power over the firm. Suppliers may refuse to work with the firm in cases such as charging excessively high prices for unique resources. Other important factors which could have an impact are, the supplier switching costs relative to firm switching costs, Cost of inputs relative to selling price of the product, Supplier concentration to firm concentration ratio and finally, the threat of forward integration by suppliers relative to the threat of backward integration by firms is also known to be an important factor.

This model would be used in identifying the various possible scenarios for the deployment of I-Box. Also, since Porter's 5 forces is a useful tool in the threats analysis, it is employed in the Opportunities and Threats analysis within SWOT analysis approach. The Figure 6 below illustrates the Porter's 5 Forces.

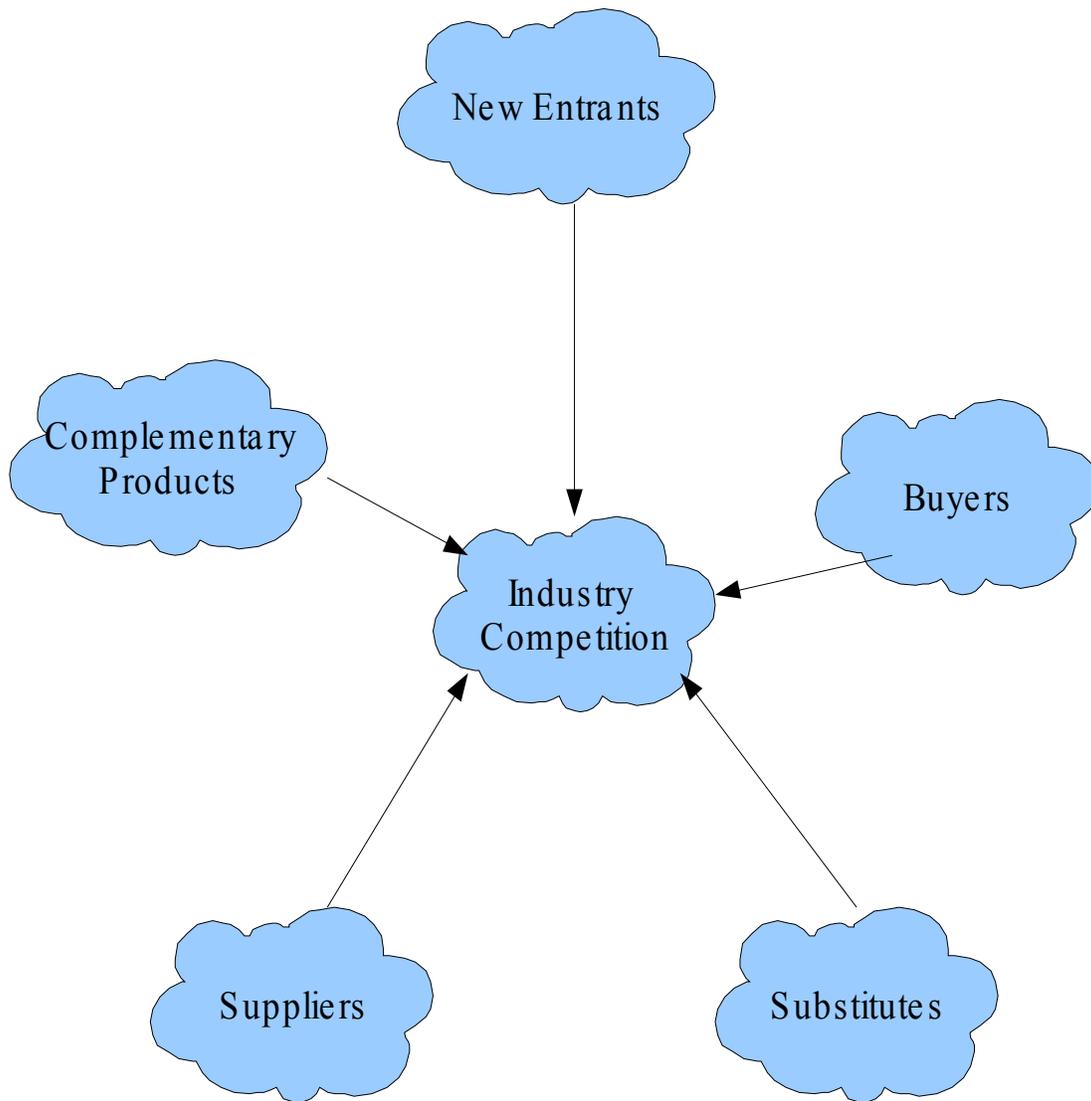


Figure 6: The Five Forces Model

2.2.3 Value Net and Value Chain Analysis

Porter's value net would be a very useful tool in this case. It refers to the whole supply chain of a product from its initial raw materials phase to the finished goods. Substitute products or services are such that the sale of one makes the other less valuable to a potential customer. Substitutes play a central role in the five forces framework that, however, does not address to complements at all.

The value net framework introduced by Brandenburger and Nalebuff [8, 43] throws light on the concept of complements. As Brandenburger and Nalebuff rightly put it, Business is a game where the playground is the ecosystem of competitors, complementors, customers, and suppliers.

Further, according to Porter, complements are the opposite of substitutes, because the sale of one promotes the sale of another. Examples for these are personal computers and operating systems or even the new and popular game consoles. While the five forces model describes how a firm within a specific industry has to tackle competitive forces in order to make profit, the value net framework states that the firm also has to manage its complementors as well. The Figure 7 illustrates the concept of a Value Net.

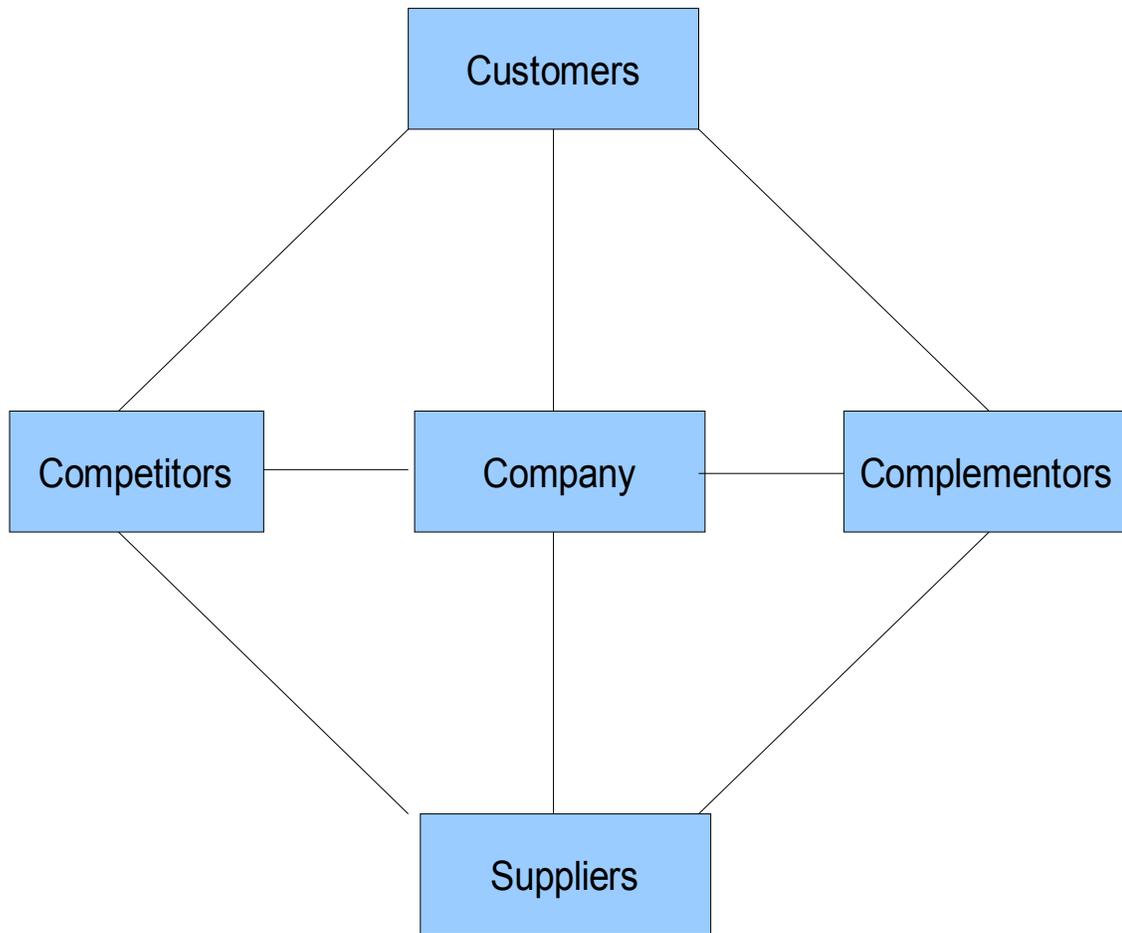


Figure 7: The Value Net

As shown in Figure 7, the company in the center interacts in two dimensions. On the vertical axis, the company interacts with its customers and suppliers, while on the horizontal axis are the players who affect the company's business but with whom the company does not directly transact. It could be noted that generally complementors may bring significant benefit to a company.

As Brandenburger and Nalebuff explain in their work, when a complementor enters the game, the pie grows. While, there is an obvious problem of sharing the pie: if someone gets a bigger piece, less is left for the others. Corporate managers could play an important

role here as they could put effort on managing complementors' relationships to ensure that there will be complements available for their offerings.

In addition to Brandenburger and Nalebuff, several other authors have written about frameworks which the authors call either value nets or value networks. However, within the purview of this thesis, the terms value net and value network are used interchangeably [8, 43].

Value Chain analysis on the other hand, is a systematic approach to examining the development of competitive advantage. It was discussed in the book, *Competitive Advantage* (1980) authored by Porter [14]. The value chain analysis is an important tool as it helps in identifying the prime activities of the company or industry and helps in understanding the economic implications of those activities. The chain consists of a series of activities that create and build value. They culminate in the total value delivered by an organization. The margin depicted in the diagram is the same as added value. On a broad scale, the organization is split into *Primary Activities* and *Support Activities*.

Michael Porter suggested that the activities of a business could be broadly grouped as:

- (1) **Primary Activities** – These are those activities which are directly concerned with creating and delivering a product
- (2) **Support Activities** – These activities are not directly involved in production but might be helpful in increasing the effectiveness or efficiency [22].

2.2.4 Marketing Channels

Success of any product to quite an extent depends on the marketing aspect involved, and choosing the right channel to market their good is also equally important. Though channel members remain independent of the manufacturer, they are free to seek their own goals and profits, both parties agree to work together for common goals and even greater profits than either could achieve independently.

Distribution is known to be the fourth traditional element of the marketing mix, while the other three elements being Product, Price and Promotion.

Broadly, there are two possible marketing channels possible:

- Direct Channel
- Indirect Channel

Direct Channel: A direct channel is a means whereby the company transacts business with its customers with no intermediaries. This mode is common in business-to-business commerce and in catalog sales or telemarketing to potential customers.

In-Direct Channel: An indirect channel on the other hand is a means whereby the company transacts business with its customers with the help of intermediaries.

As is evident, many of the current businesses use third parties or intermediaries to bring their products to market. They try to forge a *Distribution channel* which can be defined as all the organizations through which a product must pass between its point of production and consumption [23].

One of most important questions to ask at this juncture is why does a business give the job of selling its products to intermediaries? After all, using intermediaries or middlemen would actually mean giving up some control over how products are sold and who they are sold to. The answer lies in efficiency of distribution costs. Intermediaries are generally known to be specialists in selling. They have the contacts, experience and scale

of operation which means that greater sales can be achieved than if the producing business tried running a sales operation on its own.

Functions of a Distribution Channel

The main function of a distribution channel is definitely to provide a link between the production of the good and its eventual consumption. Organizations that form any particular distribution channel perform many key functions as described in Table 1 below.

Information	Gathering relevant data and distributing market research and intelligence.
Promotion	Developing and spreading communications about offers
Contact	Finding new prospective customers and communicating with them
Matching	Using methods like Assembling, Grading a product, quality packaging to Adjust the offer to fit a customer's needs
Negotiation	Reaching agreement on price and other terms of the offer
Physical distribution	The physical distribution of both basic transportation of the goods as well as their storage
Financing	Acquiring and using funds to cover the costs of the distribution channel
Risk taking	Assuming some commercial risks by operating the channel

Table 1: Distribution Channel [23]

While it is necessary that all of the above functions would need to be undertaken in any market, but the big question however is, as to who performs them and in order to make it efficient as well as cost effective, how many levels would be required in the distribution channel?

According to Philip Kotler, Marketing channels can be characterized by the number of channel levels. Each middleman that performs some work in bringing the product and its title closer to the final buyer constitutes a channel level. Since the producer and the final end user both perform some work, they are part of every channel. In this model, we use the number of intermediary levels to designate the length of a channel. The figure below illustrates several consumer goods marketing channels of different length [39].

- Zero Level Channel
- One level Channel
- Two Level Channel
- Three Level Channel

A Zero Level Channel (0LC) consists of a manufacturer selling directly to the final customer. The four major ways of direct marketing are door to door, home parties, mail order and manufacturer owned stores. Similarly, A One Level Channel (1LC) contains one selling intermediary, such as a retailer and in the same way; a Two Level Channel (2LC) contains two intermediaries. In consumer markets, they are typically a wholesaler and a retailer. Similarly, a Three level channel (3LC) contains three intermediaries.

In the figure 8 below, 0LC is called a ***Direct Marketing Channel***, since it has no intermediary levels. In such a case the manufacturer sells the goods directly to customers. An example of a direct marketing channel would be a Factory outlet store of a particular garment store.

1LC contains one intermediary. In consumer markets, this is typically a retailer. The consumer electrical goods market in the most of the countries these days is typical of this arrangement whereby producers such as Philips, Nikon etc. sell their goods directly to

large retailers such as Best Buy, M&S etc. which then sell the goods to the final consumers.

2LC generally contains two intermediary levels –

1. Wholesaler
2. Retailer

A wholesaler typically buys and stores large quantities of several producers' goods and then breaks into the bulk deliveries to supply retailers with smaller quantities. For small retailers with limited order quantities, the use of wholesalers makes economic sense. This arrangement tends to work best where the retail channel is fragmented - i.e. not dominated by a small number of large, powerful retailers who have an incentive to cut out the wholesaler. Similarly, in 3LC, there are three intermediaries acting in between the producer and the consumer. These remaining channels viz., 1LC, 2LC and 3LC are called as ***Indirect Marketing Channels***. The figure below illustrates the concept of various Marketing channels. The Figure 8 illustrates the Kotler's Marketing channels.

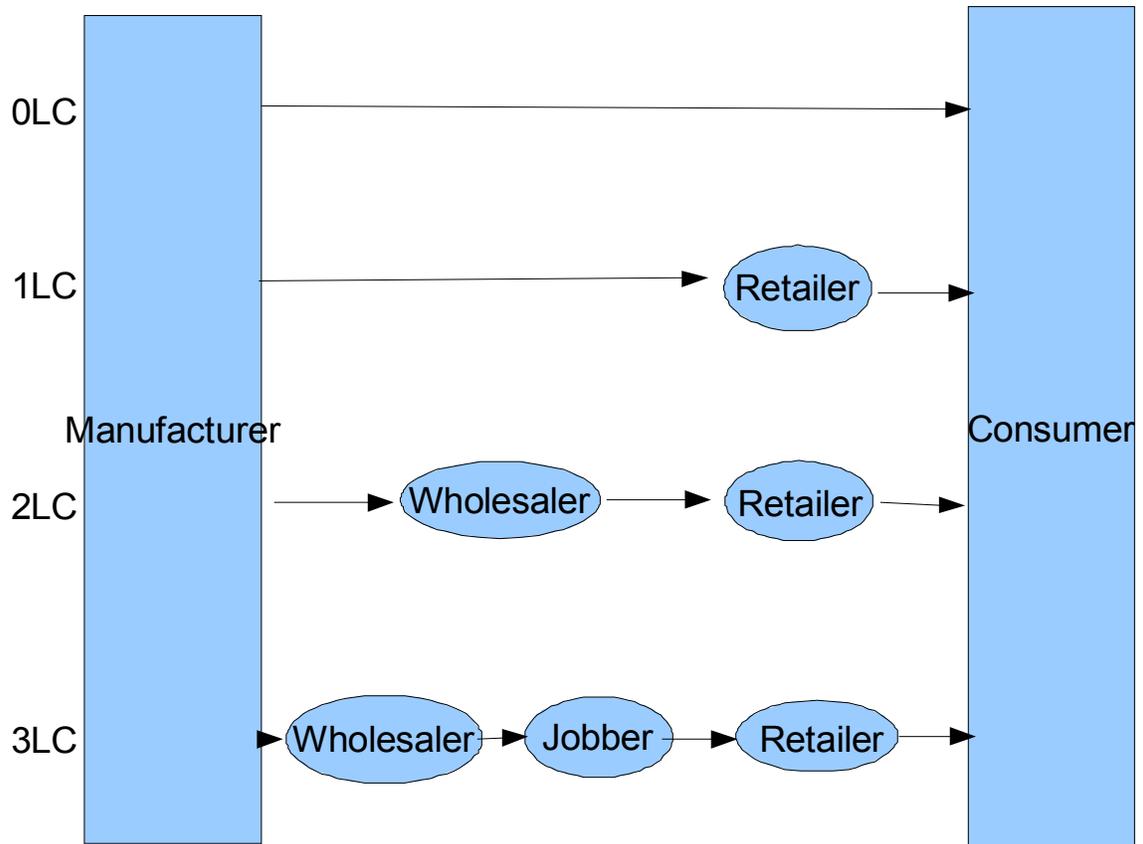


Figure 8: Kotler's Marketing Channels [39]

3. I-BOX TECHNOLOGY

3.1 I-Box: Functions and Features

This section would throw light on what exactly is an I-Box and the necessity and features of the same. Later, an overview of the InHoNets project is given followed by a use case example.

To increase the features of an existing home network gateway, we use a device called *I-Box*. This I-Box is an inexpensive small and cheap Ethernet plug-in device that is attached to the existing ADSL router. This device is configured with a Bluetooth enabled phone and the device enables secure interconnectivity between remote homes over the public Internet [6]. A pictorial representation of an I-Box is shown in Figure 9.

The crux of this InHoNets II Project is the I-Box itself, which is a standalone simple and inexpensive device that can be bought from the nearby local electronics store or a retail store or perhaps have the subscription integrated with the Service provider, and plug an Ethernet cable into the device, and after some very simple configuration (or may be even without any configuration), other home networks and their services, based on the user's contacts, become visible. This would help in easing the process and no changes would be needed to the existing infrastructure and devices, especially the existing home gateways. Also, to use the I-Box it is assumed that the user has a Mobile phone with a Bluetooth interface, wherein the Mobile phone acts as a *Control Point*.

Features of I-Box:

1. Ease of usage for the end user: It simplifies the configuration as it does the required setup or configuration on its own or with minimal support and hence helps the less technically savvy as well [1].
2. Bluetooth Technology.
3. A UPnP device.
4. Secure channel for communication.

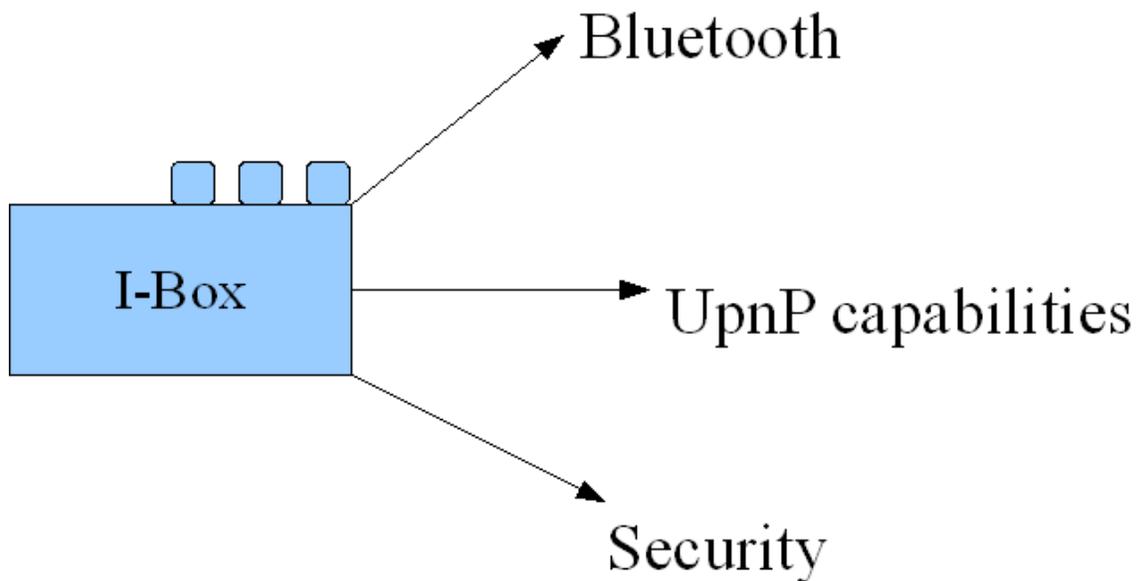


Figure 9: A pictorial representation of an I-Box

3.2 Overview of InHoNets

The previous Interconnected Home Networks (InHoNets I) project had some interesting investigation on the interconnections of home networks, and dealt with how services can be provided between different home networks and their customers. As part of their project, they created a number of software packages and some proof-of-concept demonstrations, and various requirements on the home network nodes and their functionality. One of the key results of that project was the deployment of the Universal Plug-and-Plug (UPnP) service discovery framework between home networks; as the standard UPnP technology only supports service discovery in a local environment.

While, from a more practical deployment perspective, according to the InHoNets I results many changes would be needed into the existing home networks. A key device that needs to be modified is the home network gateway (ADSL) router. It might indeed be difficult asking people to modify and reconfigure the existing devices. However, the technical

solutions developed in InHoNets are indeed useful and they can be deployed in an alternative way. In this project we develop a solution which is based on a small and cheap Ethernet plug-in device that is attached to the existing ADSL router. This device is configured with a Bluetooth phone and the device enables secure interconnectivity between remote homes over the public Internet.

The major advantage and purpose served by this device is its Ease of Usage property. As electronic consumer products become more and more complex, ease of use becomes all the more important and a major vector of differentiation. Especially in communications related products, where almost every other day, new complementing and often overlapping technologies and features emerge to enable new forms of communication, connectivity, media viewing, and entertainment, the maintaining and enhancing of ease of use appears a huge task.

At this rate, the productivity increase achieved by new technologies may be lost if growing emphasis is not put on user interface design and overall ease of usage of newly arrived communications products in the market. One probable course of evolution in mobile equipment design might be turning the direction from continuous integration to gradual disintegration and specialization of consumer products for the sake of ease of use and simplicity [11].

To achieve our goal of a seamless networking between homes, we would need a simple way to introduce the inter-home functionality into existing home network installations. Such a functionality must include seamless support for UPnP [4], NAT/firewall traversal for the services between home networks, confidentiality of the signaling and user data inside and between home networks, authentication and authorization for the access to services, while still being easy for a common end user to set up and configure.

One way to introduce this functionality is to download software to a home PC, and then run the PC as some kind of proxy. Another way is to upgrade the software of the home gateway, as proposed by the InHoNets project. These solutions are both fine for the computer science engineer, but these are not options for the ordinary users. We need

something much easier and simple. One simple way for the user to indicate which other people can use the home services is to use the mobile phone contact list. The user has the phone numbers of people he trusts, and by giving these phone numbers through the I-Box to the operator, the operator can map the users and their home broadband services together. Thus, users can use the familiar phone numbers to indicate trust in the home internetworking. Figure 10 shows an Initial technology overview of the Interconnected Home Networks project.

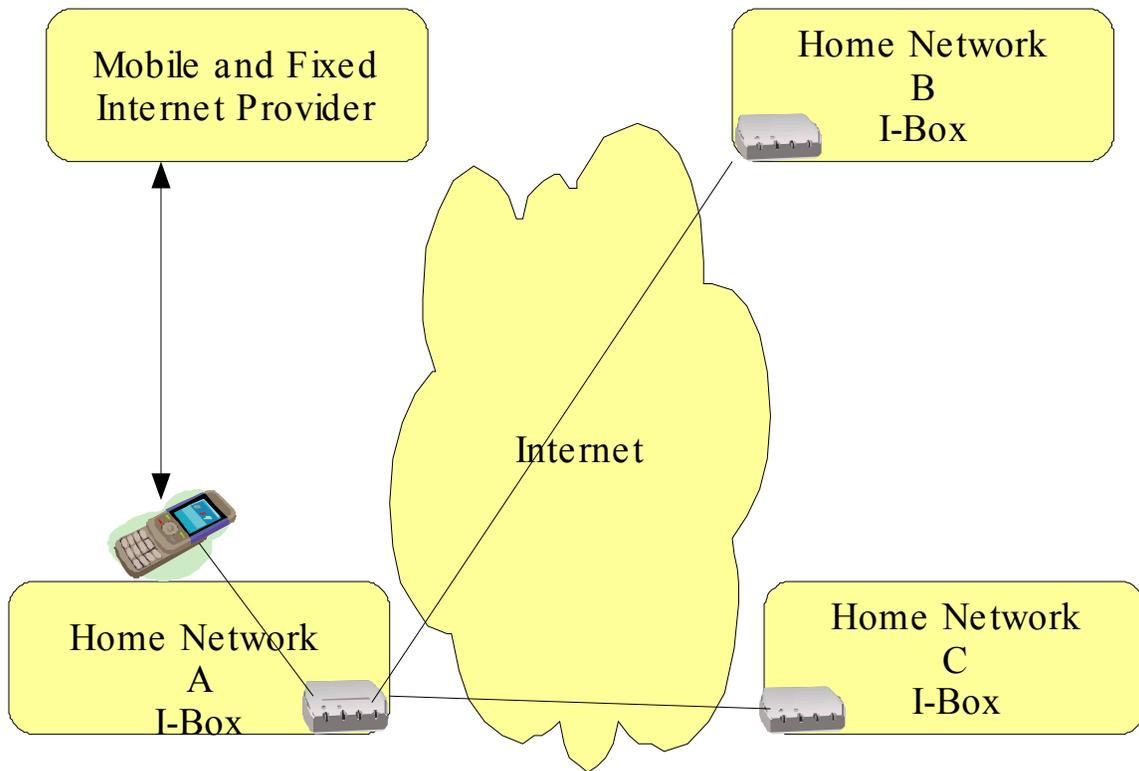


Figure 10: Initial technology overview of Interconnected Home networks [6]

3.3 Simple Use-Case

Now assume the following example, Let us say A and B are two different home Networks and they want to share their pictures with each other. While it is possible to upload them on the web and share, but that might not be easy for a less techno savvy. Instead, with the help of Home Network it can be shared very easily. Both A and B connect their respective I-Box's to their gateways. The Figure 11 illustrates a home network between two homes, A and B.

In our usage scenarios we presume that intended users of connected home networks are known to each other, that is, either they are friends or members of the same family. In addition to this, we assume that at least each of the home obtain one public IP address (mostly that would be used as the IP address of their home gateway)and that IP address would be known to each other prior to the connection establishment. Further, we also make an assumption that our devices in the home network are enabled with the UPnP technology and the gateways of each home network would have a Bluetooth interface.

Now homes, A and B are friends of each other and they share their media servers. Now Home C wants to join with this group to view contents from their media servers. At this junction, Home C makes a call to Home A giving various details like, its gateway's IP address to share its media server. Although at this point, A might be away or be available near his computer but he is having his personal mobile phone at his disposal. So now it would be more convenient for A if he would be able to establish a shared home networking environment between his home and C's home without reaching to his computer, just making few clicks from his mobile phone.

This scenario leads to the fact that specific device of a home network should be shared by individuals using their hand-held devices. Since, users use control point to obtain information about the available devices of a home network. Usually one of the UPnP devices (mostly PCs) of a home network is used as control point in a network, and in this project we would be using hand-held devices like our mobile phone as a device to share other devices of the network, so here mobile phone would act as a *control point*

with enhanced functionalities like sharing a particular device of a network or revoking the permissions of a shared device.

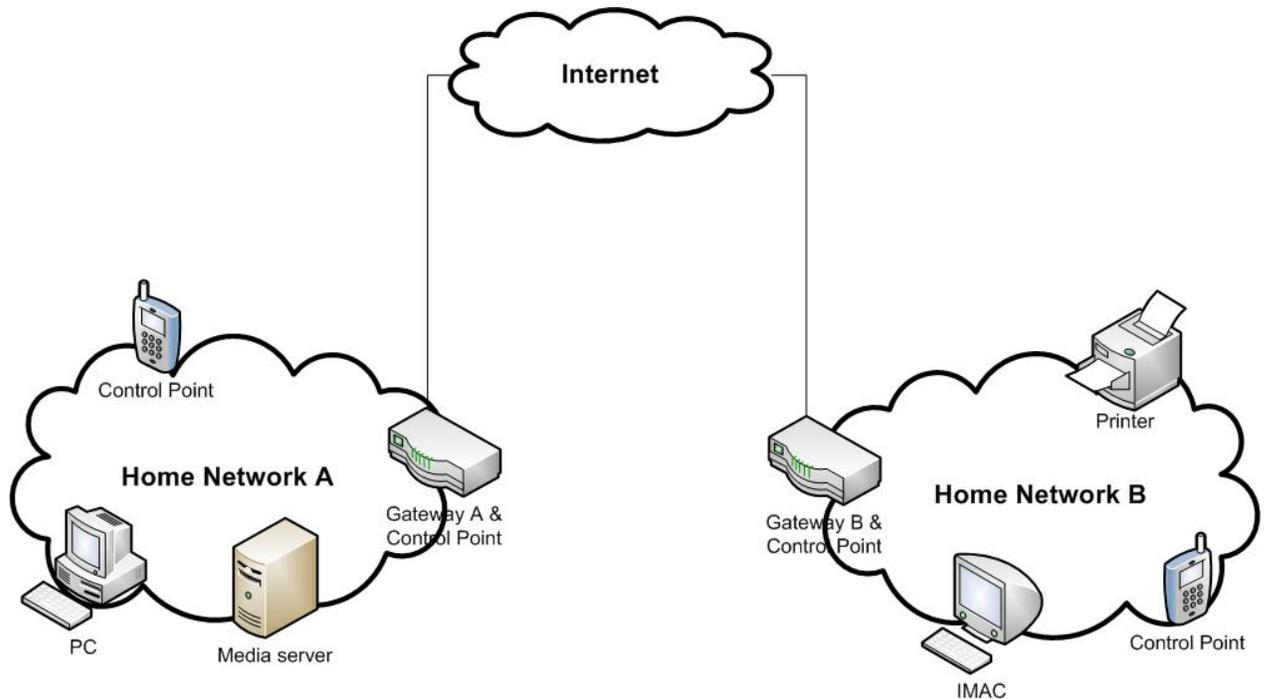


Figure 11: Home Network between Homes A and B

An Example Scenario:

Let us assume that the user is a customer of an operator O, who has a Mobile phone and an existing ADSL subscription. Firstly, the user procures an I-Box, brings it home and connects and does the pairing with the help of Bluetooth technology. After this step, the mobile phone sends an authentication message to operator O, who can then map the user and his or her I-Box with the ADSL Internet service. Similarly, other customers of the operator can do the same thing, and the users can then indicate which other users and

their respective I-Boxes should be able to peer and exchange UPnP service announcements. Now, this I-Box becomes a service of the operator O, who provides the authentication and connectivity service to the I-Box owners to its customers.

A simple and more practical example of an actual content and services offered by people to each other could be as discussed in the following: Let us say Pekka lives in California, USA. He has new data to share with his near and dear ones like Videos and pictures taken through his new Nokia N93 from his recent expedition trip to Oslo, which he would now want to share with his parents who live quite a distance away in China. Using the I-Box, Pekka can now make the content available to his parents with ease, as his parents can use their familiar set-top-box and TV to enjoy the pictures from his Mobile phone.

4. DEPLOYMENT SCENARIOS

4.1 Scenario Construction

To construct the possible scenarios for the deployment of I-Box we employ various theoretical frameworks like Kotler's marketing channels concept discussed in the Background section. As the I-Box is going to be an inexpensive device, the challenge is to analyze the market dynamics and propose possible scenarios for this device, for example, the I-Box (and devices) can be owned and leased from the service provider, as the I-Box can be bundled with the existing ADSL subscription, cellular subscription and/or content services or bought from a departmental retail store nearby or through other possible scenarios [36]. Also, in the combined scenarios the home owner can buy multiple I-Boxes of different types for the same ADSL connection, which in turn enables user-friendly service-specific packaging of I-Box, devices, content, authentication or billing [1, 6].

The scenario construction process involved the identification of the right Business Deployment channels for the I-Box. For this, the following frameworks and tools were used:

- Porter's Five Forces
- Kotler's Marketing Channels
- Value Net and Value Chain Analysis.

To start with, for the scenario construction process, the major tool employed is the Kotler's marketing channels. The Figure 14 illustrates the various modes possible to deploy. Specifically, for the I-Box we have the following cases:

- Direct to the customer
- Intermediate channels or indirect channel to the customer

Direct to the Customer: In this scenario, the end product is shipped directly from the customer. As discussed in the previous chapter within the Marketing Channels, it comes under *Direct Marketing Channel* category.

Intermediate Channels: Also popularly referred as *Indirect Marketing Channel*, the end product takes the intermediate route of Distributors, Wholesalers or Retailers before it reaches the End User or the customer. The figure below illustrates a generic Industry level scenario. The Value Chain at an industry level is depicted in Figure 12.

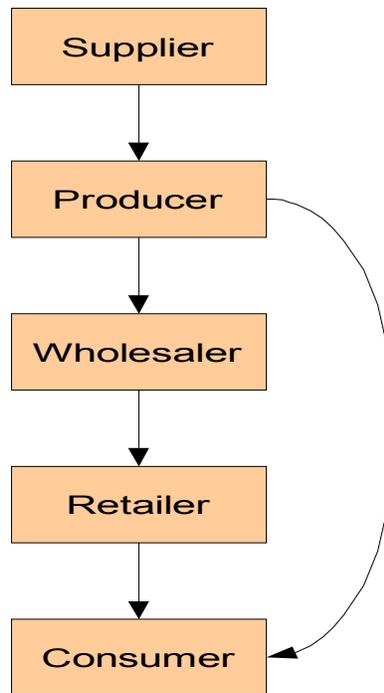


Figure 12: Value Chain at Industry Level [7]

Re-intermediation Value network:

A re-intermediation value network is a classic case in which there is an electronic intermediation on the Internet and the role of Wholesaler and Retailer is changed. In the intermediation, the seller could be a wholesaler as well, but the media is Internet. Popular web portals like eBay and Amazon.com are some of the examples in this kind of re-intermediated value network [7]. The Figure 13 illustrates the Re- Intermediation network

value chain. The Online model is a classic case of this Re-intermediation network wherein the Internet is the media and the customer can procure the I-Box from web portals like eBay on the Internet.

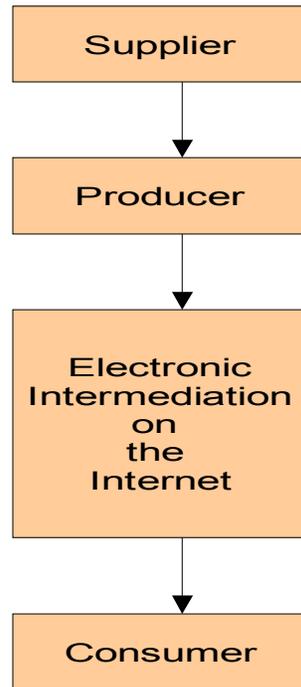


Figure 13: Re-Intermediation Network Value Chain [7]

In this approach, the I-Box is procured by the customer through the electronic intermediation on the internet, which is basically the online purchase of the good from various web portals like eBay, Amazon etc.

As the deployment strategy is a very important factor for the success of any product, the possible value chains and value systems are evaluated. To understand this better, we use a generic Mobile value chain as a reference which is shown in figure 14. We take the above mentioned business value chain as the framework and study it in the context of the I-Box value system. The above shown value chain is modified for the purpose of this thesis, with a focus on the deployment scenarios for the I-Box, which is illustrated in Figure 15. The Figure 14 shows a generic Mobile Business value chain [3, 7], and can be modified

for a better understanding of the I-Box value chain. The value chain broadly shows the Terminal, Network and Content value systems in the generic model.

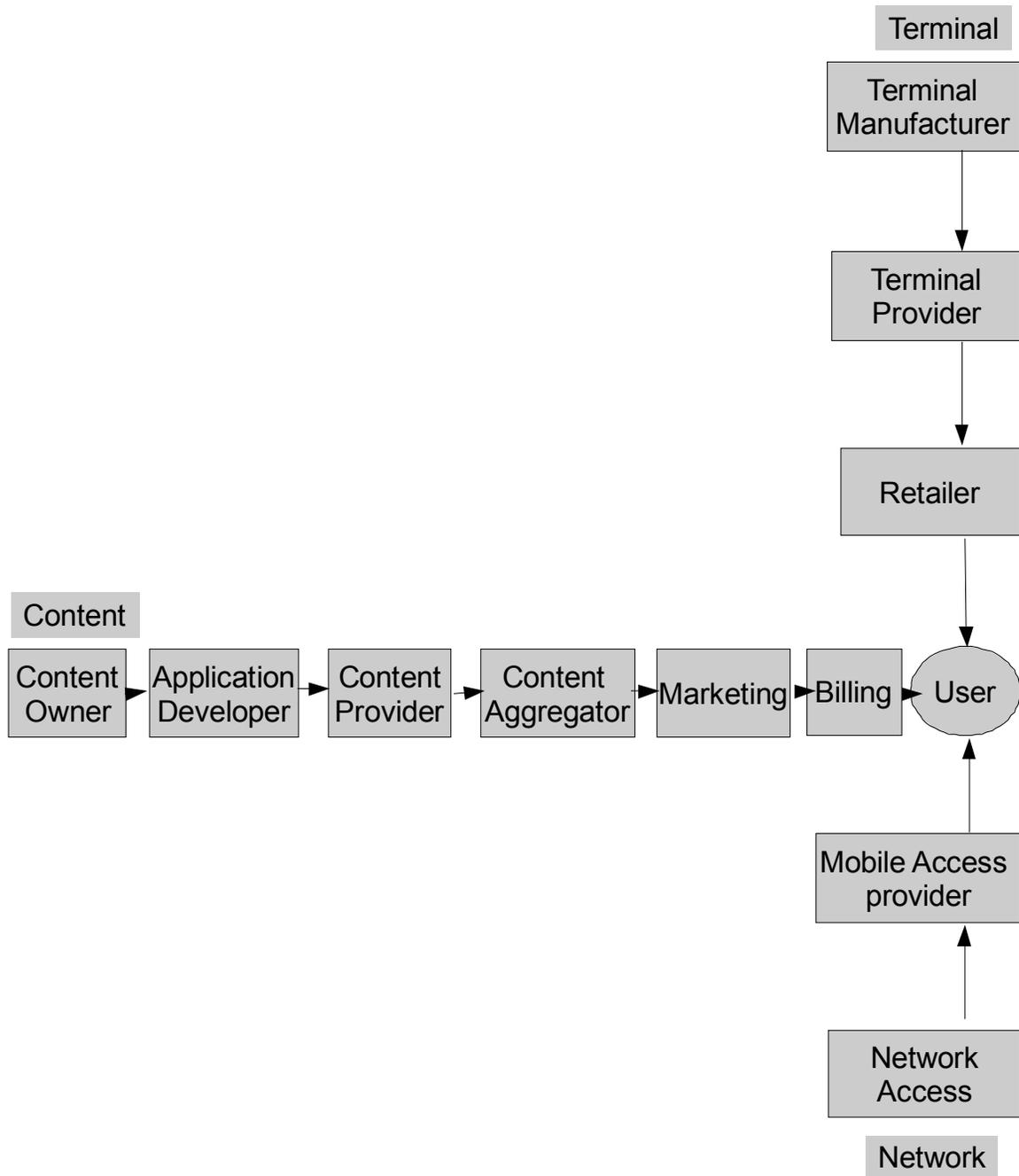


Figure 14: A Generic Mobile Business Value Chain [7]

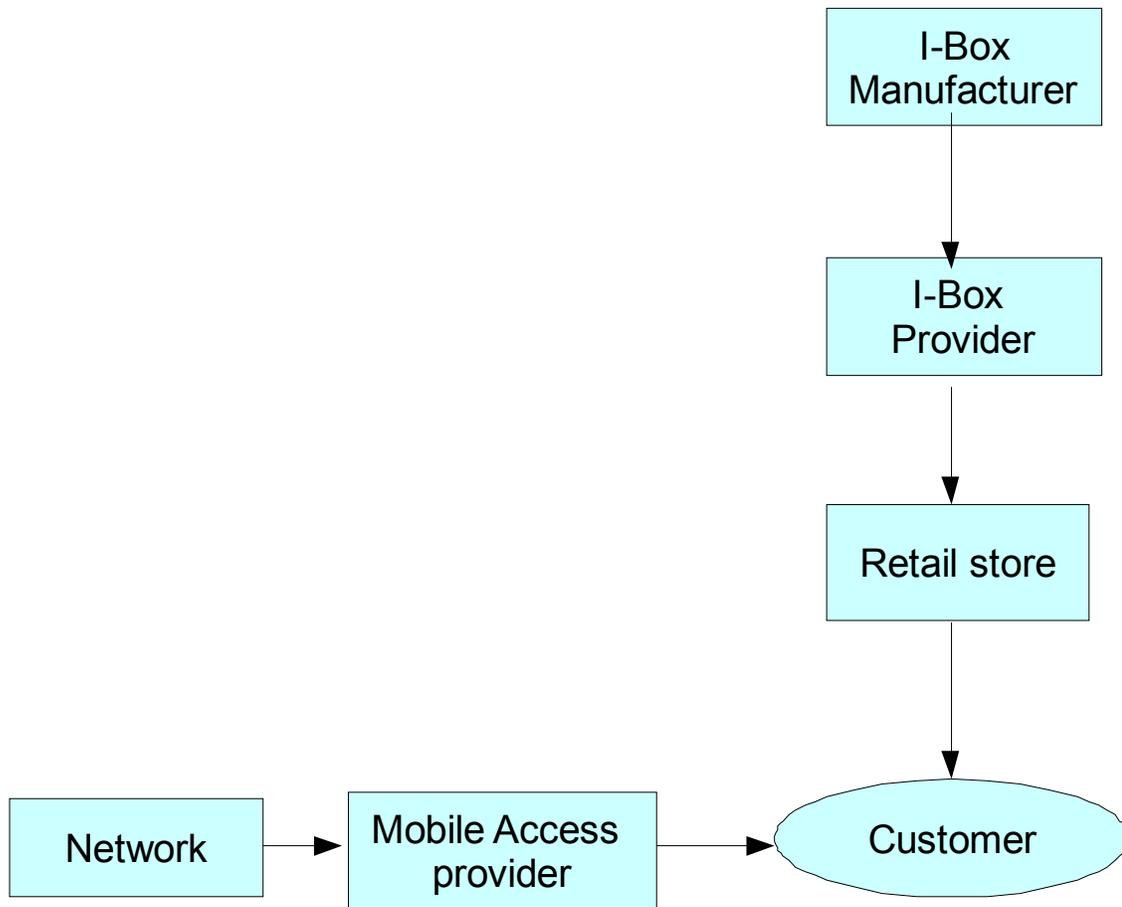


Figure 15: I-Box Business Value Chain [2, 7]

The Figure 15 shown above is an extended (modified) version of the generic mobile business value chain as shown in Figure 14.

Thus, broadly, I-Box, the hardware in the home network can be bought in four different ways by end customers, which are essentially four possible cases for the distribution channel:

1. The Network Operator bundles it with a subscription, this model is called *Subscription Model*.
2. A Do-it-yourself mode wherein the customer buys it from a local departmental retail store, this model is called *Retail Model*.

3. The customer buys it online through web portals like eBay, this model is called *Online Model*.
4. Direct to home from the Manufacturer, this model is called *Direct-to-Home Model*.

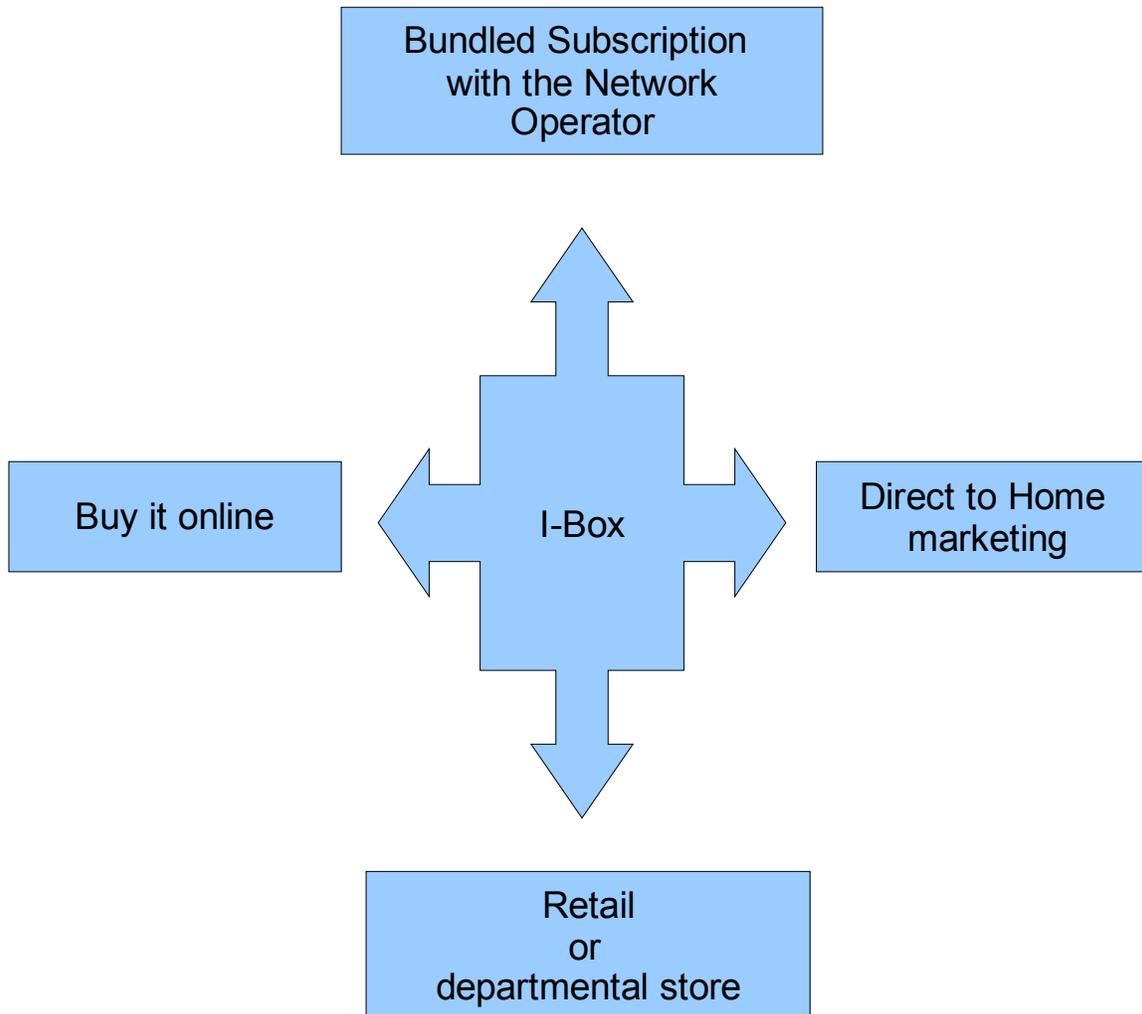


Figure 16: Possible Scenarios for Sale of I-Box

Based on the above models and frameworks, a total of four possible scenarios are illustrated for the deployment of I-Box in Table 2:

<p style="text-align: center;">Scenario 1 Subscription Model</p>	<p style="text-align: center;">The Network Operator bundles it with a subscription</p>
<p style="text-align: center;">Scenario 2 Retail Model</p>	<p style="text-align: center;">Do-it-yourself: The customer buys it from a local departmental retail store like K-Market or Wal-Mart</p>
<p style="text-align: center;">Scenario 3 Online Model</p>	<p style="text-align: center;">Buy it online through web portals like eBay, Amazon etc.</p>
<p style="text-align: center;">Scenario 4 Direct-to-Home Model</p>	<p style="text-align: center;">Direct to home from the Manufacturer</p>

Table 2: Various Deployment Scenarios

Thus, as shown in the Table 2 above, the four possible deployment scenarios are discussed and a detailed understanding of each model is done in the following sections.

4.2 Subscription Model

This model is quite handy in that the Network operator bundles the I-Box subscription with the existing Mobile operator connection. Also in this model, Businesses benefit because they are assured a constant revenue stream from subscribed individuals for the duration of the subscriber's agreement. Not only does this greatly reduce uncertainty and the risk factor involved in the enterprise, but it often provides payment in advance, while allowing customers to become greatly attached to using the service and, therefore, more likely to extend by signing an agreement for the next period close to when the current agreement expires, this greatly reduces the customer acquisition costs, and allows personalized marketing. However, a requirement of this system is that the business must have in place an accurate, reliable and timely way to manage and track subscriptions.

A subscription model may be beneficial for the software buyer if it forces the supplier to improve its product. Accordingly, a psychological phenomenon may occur when a customer renews a subscription that may not occur during a one-time transaction: if the buyer is not satisfied with the service, he or she can just opt to leave the subscription to expire and find another seller.

From a marketing-analyst perspective, it has the added benefit that the vendor knows the number of currently active members, since a subscription typically involves a contractual agreement. This kind of contractual setting facilitates a better and enhanced Customer Relationship Management (CRM) to a large extent because the analyst knows who is an active customer and who is not. Consumers may find subscriptions convenient if they believe that they will buy a product on a regular basis and that they might save money. For repeated delivery of the product or service, the customer also saves time.

In the case of unlimited usage subscription to a service for a fixed price is an advantage for consumers who would be using those services frequently. However, it would not be favorable to a customer who initially plans to use the service frequently, but later does not. The commitment to paying for a package may have been more expensive than a single purchase would have been. In addition, subscription models increase the possibility of vendor lock-in, and consumers may find repeated payments to be onerous.

Finally, subscription models often require or allow the business to gather substantial amounts of information from the customer and this raises issues of privacy [42].

Now, this model can be very effectively used in the Deployment of an I-Box. In this approach, the Network operator or the Mobile access provider is the main player and they bundle the I-Box subscriptions with the existing ADSL subscription. The Figure 17 below illustrates this concept in the context of an I-Box.



Figure 17: Subscription Model

4.3 Retail Model

In this model, the customer or the end user buys the I-Box device from a retail outlet as per their convenience. In this channel, intermediaries such as Retail stores or other departmental stores play a pivotal role in making a product reach successfully to an end customer. A Retail model has the following advantages:

- Retailers generally have a much stronger personal relationship with the consumer.
- The retailer will hold several other brands and products. A consumer will expect to be exposed to many products.
- Products and services are promoted and merchandised by the retailer.
- The retailer will give the final selling price to the product.
- Retailers will often offer credit to the customer e.g. electrical wholesalers, or travel agents.
- Many big Retail chains have a strong brand image like the famous ones such as Wal-Mart, Best Buy or K-Market etc.

Now, this model can be very effectively used in the Deployment of an I-Box. In this approach, the Customer procures the I-Box from a nearby departmental or a retail store and plugs it to the Home gateway and with very less or perhaps no configuration the additional functionalities of the Home network is introduced. The Figure 18 below illustrates this concept in the context of an I-Box.

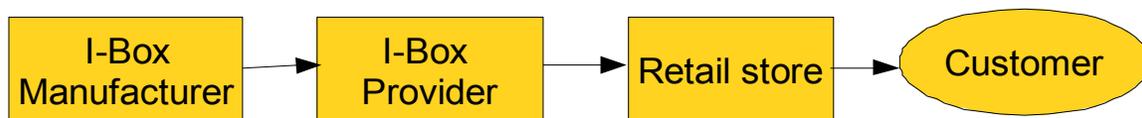


Figure 18: The Retail Model

4.4 Online Model

The Customer procures the I-Box online by logging onto an online web portal which sells the I-Box. The Buy-it-Online model is a type of special marketing called *e-Marketing* [5]. In this type of approach the following cases are possible:

- A company can distribute via the Internet media like done by eBay or Amazon.com. It could also use the Internet as a way of building and maintaining a customer relationship like as is done by computer vendor Dell.
- It could also be used in the money collection part of a transaction which could be done online as well. For example, electricity and telephone bills can be paid online.
- Also, a significant amount of various leads can be generated by attracting potential customers to sign-up for short periods of time, before signing up for the long-term which gives a scope for the customers to experiment as well.

According to the authors, Erik Brynjolfsson, Yu Hu and Michael D.Smith in their work *From Niches to Riches: The Anatomy of the Long Tail*, they discuss that the internet market place allows companies to produce and sell a far wider range of products than ever before, which profoundly changes the consumer behavior and business strategy [2].

Now, this model can be very effectively used in the Deployment of an I-Box. In this approach, the customer using internet logs into a web portal like eBay.com which sells the I-Box and orders it online. The Figure 19 below illustrates this concept in the context of an I-Box.

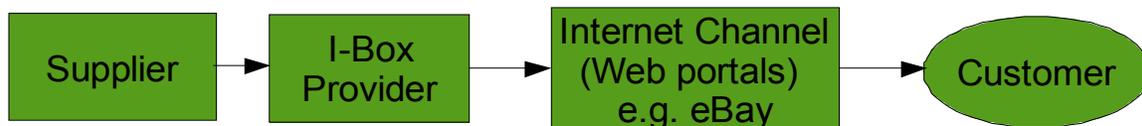


Figure 19: The Online Model

4.5 Direct-to-Home Model

In this model, the customer can be reached by doing a door-to-door marketing for the I-Box. Direct Marketing or 0LC (Zero Level Channel) , as discussed in the Kotler's Marketing Channels, is a channel free approach to distribution and/or marketing communications. In such a channel, a company may have a strategy of dealing with its customers directly, for example banks like Nordea Bank or Computer manufacturers like Acer could employ this method. There are no channel intermediaries in this model like Distributors, Retailers or Wholesalers. Thus direct to home is in a way a deal which is done directly between the Manufacturer and the end user.

As mentioned above, direct also in the sense that marketing communications are targeted at consumers by the manufacturers. For example, a brand that uses channels of distribution would target marketing communications at distributors, retailers, and consumers, or a blend of all the above three levels. On the other hand, a direct marketing company could focus upon communicating directly with its customers. Also, it would be interesting to note the difference between direct marketing and Direct mail, although direct mail is a type of direct marketing tool. A major advantage in this scheme is that information can be processed quickly, and then categorized into complex relational databases.

There are a number of direct marketing media other than direct mail. For example:

- Inserts in daily newspapers and magazines like catalogs and Coupons
- The Internet and New Media
- Dedicated customer help lines
- TV and radio advertisements with free phone numbers or per-minute-charging.

This is the digital age, most of the work is being done through the power of technology. The new upcoming media such as the Smart phones or PDA's and even Internet to some extent are very suitable for direct marketing. Consumers have never had so many sources of supply, and suppliers have never had access to so many markets. Many companies use direct marketing, and a current example of its use, as part of a business model, is the way in which it is used by low-cost airlines like Ryan air etc. There is no agent in between as

the customer could directly book tickets with the airlines over the Internet and even choose his or her favorite seat. This also helps the airlines as they can capture data that can be used for marketing research or a loyalty scheme or other popular frequent flyer's program.

Companies such as eBay are wholesalers of various types of Books and they do not publish the contents of the book, so they use Customer Relationship Management and marketing communications targeted directly at individual customers, which is essentially a mode of direct marketing.

Now, this model can be very effectively used in the Deployment of an I-Box. In this approach, the I-Box manufacturer plays an important role, wherein the I-Box is sold on a door-to-door basis directly to the customer avoiding the intermediaries. The direct-to-Home Channel is most fruitful where the labor costs are less. In the western countries (Europe) where the costs are higher, this might not be the best of models. Figure 20 below illustrates this concept in the context of an I-Box.



Figure 20: The Direct-To-Home Model

5. ANALYSIS

The Major methodology in the analysis of the Deployment scenarios for the I-Box has been the popular *SWOT Analysis*. Further, we also use another technique called *Axiomatic Table* approach to validate and complement the findings from the SWOT analysis. Before we discuss the two methodologies, an understanding of the End User is also an important means to achieve our final goal. The *End User* Behavior constitutes an important part of any product's deployment strategy and we discuss that concept in the context of Home Networks and specifically the case of I-Box.

5.1 End User Analyses

An end user may be defined as *anyone who uses a product*. Thus an important question which arises is, as to who is the eventual end-user? In the context of the I-Box a potential end user is one who is actually using a Home Network for their entertainment and business needs and would be using the I-Box to connect it to the existing Home Gateway within his or her home network and increase its features and functionalities.

The End User Needs Analysis defines the requirements and expectations from the customer's perspective. To effectively meet users growing expectations, the first step in user needs analysis is to identify and categorize who the target customers for the I-Box are.

Thus in a nut shell, the characteristics and requirements in general of a potential End User for an I-Box could be summed up as follows:

- An Existing Home Network User
- A user looking for a cheaper and a better alternative for the upgrade, not necessarily a techno savvy but would want additional features with least amount of self configuration.
- A Mobile phone user with a Bluetooth interface which would be used as a control point for the Home Network.

5.2 Pricing Analysis

Price in a business sense is generally the assigned numerical monetary value of a good, service or asset. Success of a product to quite an extent depends on the pricing strategy employed by the firm, more so in the case of new technology product introduction, as in the case of I-Box. As this device is going to be cheap and inexpensive, and also taking into account that it is a device which enhances the existing Home Network's capabilities and functionalities, the pricing of I-Box would not be very expensive. A summation of its functions and capabilities could be as follows:

1. A UPnP capable device
2. Bluetooth technology
3. Secure communication channel

To obtain the above features on to a device would not be very expensive and depending on the cost of manufacturing, Marketing and transportation costs, we assume it to be reasonably priced.

5.3 Analysis Framework

A framework for identifying the best possible scenario for the Sale of I-Box is as described below with the figure giving an overall analysis approach. In this, as in the previous sections, the four possible scenarios were identified using various business models and Frameworks. Various factors which might affect the four identified deployment scenarios are taken into account and are handled on a case by case approach.

A thorough SWOT analysis on each of the four possible frameworks is done for example, a SWOT analysis on the Subscription model is done by identifying the Strengths, Weaknesses, Opportunities and Threats in that model. Similarly, other identified scenarios are taken and a SWOT is conducted on each one of them.

To complement the SWOT Analysis, an *Axiomatic Tabular analysis* is also done. In this approach, a set of important parameters are identified and an axiomatic analysis is done on each corresponding deployment scenario. For Example, an important parameter called

Aid and Advice is identified and is applied against Subscription Model, Retail Model, Online Model and Direct-to-Home model. Similarly, other parameters are also applied on each on the identified four scenarios.

Why SWOT and Axiomatic Analysis?

One of the important reasons why SWOT analysis was used can be summed up as follows:

- SWOT is a Classic tool for evaluating the competitive advantage of a product and as is the case with I-Box.
- It helps in Risk analysis, which is essentially identifying the inherent opportunities and threats. Though, the Porter's 5 forces has also been a vital tool in identifying the Threats in each Deployment model.
- Also, it is a very useful tool when a very limited amount of time is available to address a complex strategic situation

The Axiomatic Analysis has been used to complement the findings from SWOT analysis. Figure 21 below illustrates the Analysis Framework.

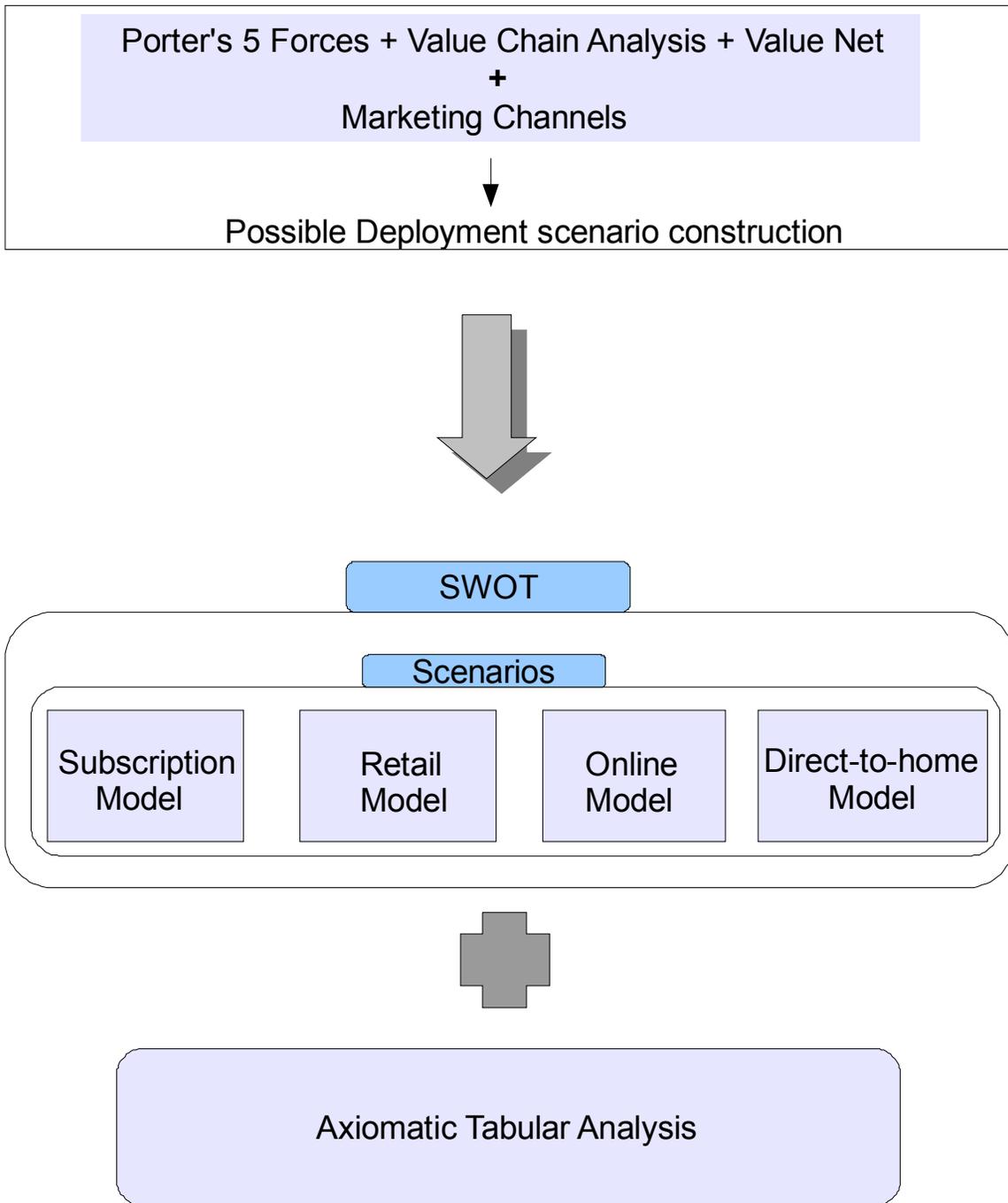


Figure 21: Analysis Framework

5.4 SWOT Analysis

This analysis constitutes a major part of the Analysis framework used and would be discussed in detail in the context of I-Box and the four identified deployment scenarios. To start with, one important concept to understand is what exactly is a SWOT Analysis?

According to Philip Kotler **SWOT** stands for *Strengths, Weaknesses, Opportunities and Threats* and is a widely used tool as the name suggests to analyze the Strengths, Weaknesses, Opportunities and Threats of a business venture or a new product [40]. Identification of SWOT's is essential as it helps in understanding the possible impact a product may have on the market [37]. Although this kind of analysis is relatively easy to conduct, it is still considered to be a very powerful method for identifying both the environmental influences towards the object and also the capabilities of the object which is analyzed a like a business unit , a rival company and a person etc.

Strengths: It could be about the Strengths of the product or the attributes of the organization that are helpful to achieving the objective.

Weaknesses: It explains about the flaws or weaknesses in the product or attributes of the organization that are harmful to achieving the objective.

Opportunities: Mainly about the external conditions that are congenial to achieving the objective.

Threats: The possible threats posed to a product or some external conditions that are not congenial to achieving the desired goals.

Any SWOT analysis consists of two major parts:

External Environment Analysis (Opportunity and Threat Analysis)

Environmental scanning, which is quintessentially a tool that helps in discerning new marketing opportunities. It also helps in determining the attractiveness and success probability of an opportunity. Similarly, some development in the external environment represents threats. In this case, an environmental threat is a challenge posed by an unfavorable trend or development trend or development that would lead, in the absence of defensive marketing action. The important goal thus of this analysis is to do a thorough analysis of the various Opportunities and Threats perceiving the product or the Company itself. The Porter's 5 forces has been a useful framework in understanding this.

Internal Environment Analysis (Strengths and Weaknesses Analysis)

It helps to discern attractive opportunities and another to be able to take advantage of these opportunities, which in other words is to analyze the Strengths of the Product and improve on its weaknesses. Thus the key goal of this analysis is to identify the Competitive Strengths and Weaknesses of the product or the company itself.

A SWOT analysis for each of the four identified Deployment scenarios is done. In this approach, a thorough analysis of the Strengths, Weaknesses, Opportunities and Threats of each model is done to identify which model gives the maximum value from a Customer's perspective.

5.4.1 Scenario 1: Subscription Model

As discussed previously, in this case, the Service provider bundles the I-box sale through the existing Mobile/ADSL subscriptions. A SWOT analysis of this model is as follows:

Strengths:

- An Effective service aggregation could be an important factor. Since most of the consumers will not be willing to pay for management as such; the cost of management could be hidden within a service bundle.
- It also helps in the reduction of Market costs and is therefore cost beneficial.
- One stop shop for all your Home networking needs: The bundled subscription is a good example of a one stop for the entire Home networking services and might even involve its total management.
- This model helps in a better Customer Relationship Management as a dedicated channel for the customer's benefit could be made possible.
- Possibility to offer a broad integrated management solution for the home networking needs.

Weaknesses:

- Conscious of the brand image as you are associated with your collaborator.
- Some Customers might want different services and not get locked up with one operator.

Opportunities:

- It gives an opportunity for network operators to control and offer new services at their convenience.
- High probability of retaining the existing customer, as the customer might be interested in going with same provider to reduce additional burden.

Threats:

- This model is threatened by end users who are not comfortable to face “Lock-in” situation and additional costs of the closed network operations.
- Faster deployment and interconnection could be a vital point as end users might expect better services and if unable to, it might cost the operator business as they might lose the customer.

5.4.2 Scenario 2: Retail Model

In this model, a customer procures the I-Box from a nearby Retail or departmental store. A SWOT analysis of this model is as follows:

Strengths:

- It gives the scope for a customer to see it to believe it, buy the good if the customer likes it; this case assumes that the customer has a prior knowledge about the features and functionalities of I-Box.
- Better Accessibility: It is easier to obtain the I-Box for an end customer from a nearby retail store.

Weaknesses:

- Customers might not want to split the purchase of I-Box separately, instead might want to go in for all in one subscription.

Opportunities:

- It gives a great opportunity for the company to market their product, by assigning a dedicated sales person for this activity at the targeted stores.

Threats:

- On the contrary, some customer's might not want to invest separately on each service, and might want to go in for a one solution for all strategy.

5.4.3 Scenario 3: Online Model

In this model, the customer can obtain the I-Box by logging into e-business portals like eBay.com and order it. A SWOT analysis of this model is as follows:

Strengths:

- E-Commerce and specifically, e-purchasing is the order of the day, advent of internet has greatly increased the ability of companies to conduct their business faster, more accurately, over a wider range of time and space, at reduced cost, and with ability to customize and personalize customer offerings [40].
- Reduces infrastructure costs as the media is the World Wide Web, which could reduce additional costs. In other words, it reduces the supply chain, which might have an effect on the final cost of the good.
- Availability of the good is high, a 24/7 reach is a huge advantage.
- Forecasting the supply-demand becomes easier in this model.

Weaknesses:

- Not all customers would want to buy online as it might depend on their convenience.
- The information availability might be an area of concern, as the customer might want to get better oriented about the features or advantages of the product before buying.

Opportunities:

- It could be a very good opportunity for the online firms to place advertisements about the product and campaign through newsletters, pay per click mode etc. to invite customers.
- Trial before commitment to buy can also give them an increased customer base.

Threats:

- Maintenance of the product or the services offered becomes an issue in this model as the customer has to identify the service provider for the Home Networking through I-Box.

5.4.4 Scenario 4: Direct-to-Home Model

In this model, the I-Box might also be delivered on a door-to-door basis, wherein the manufacturer directly interacts with the customer. A SWOT analysis of this model is as follows:

Strengths:

- An example of a Zero-Level channel (0LC) [39] as the manufacturer would be selling directly to the customer and hence reducing the intermediary costs involved.
- Aid and Advice about the product is a huge advantage, as One to One marketing, might help in demonstration of the product to the potential customer, and then the customer can make up to buy it more convincingly.
- The availability of data regarding I-Box, its features and functions is more and hence is easier to convince and decision making becomes easier.

Weaknesses:

- Time and money involved in reaching the customers might be higher when compared to other modes.
- Sales representative (Labor) costs could be expensive in western countries where labor charges are high.

Opportunities:

- Doing road campaigns, door to door campaign would increase the customer reach.
- Hotline numbers, dedicated customer service channels available on a phone call would work favorably.

Threats:

- Availability of the product all the times is not assured as it depends on direct marketing.
- Under certain circumstances, this model might not be very cost effective for the manufacturer.

5.5 Axiomatic Table Approach

In this analysis, we use an axiomatic approach. The table below shows the axiomatic analysis regarding the deployment scenarios for the sale of the I-Box. This self analysis is done on the basis of perceived information available taking a particular business scenario into account. Different parameters are identified which could have a bearing on the Deployment of I-Box and a detailed description of each one of them is done.

Identification of Parameters:

The parameters used in the Axiomatic Table analysis were identified using various perceived factors taken into account before buying a product by an end user. The end user perspective and the factors which might differentiate the Four identified Deployment channels are the key elements used in arriving at the parameters. Thus a total of 6 perceived parameters were identified which are further discussed below.

Grading Methodology:

In this table, we use the following grading, as perceived by an end user:

1 = Low

2 = Medium

3 = High

While for Possibility to Experiment parameter, the scaling could be also understood as follows (the above grading scale and this one can be used interchangeably).

1= Difficult

2= Medium

3= Easy

The Following parameters were used in this approach and a brief review of what it means in the context of the 4 scenarios for the I-Box deployment:

Cost Effectiveness:

Cost effectiveness is a very important parameter, as it compares the relative expenditure like costs and the outcomes like effects of two or more actions. The Cost-Effectiveness analysis (CEA) is a form of economic analysis that compares the relative expenditure (costs) and outcomes (effects) of a given course of action. In the context of I-Box, this is a major parameter as it gives an indication of how beneficial is a product as perceived by a potential end customer.

Ease of Availability:

Availability in a general sense refers to the ability of the user community to access a given product or a system. If a user cannot access the system or procure a product with ease, then it is said to be unavailable. The ease at which the I-Box is available to a potential customer is an important factor which could determine its success and also affect its reach ability.

Aid and Advice:

Aid and Advice in the context of a technology is a form of relating personal opinions and recommendations about certain features of a technology or a product offered as a guide to action or conduct. This essentially means specifically in the context of I-Box as getting some practical information about the I-Box and the need and necessity to buy it. Availability of relevant information about a product constitutes the vital “End User Behavior” which could make the product more visible and increase its reach ability.

Maintenance:

Maintenance may be defined as the modification of a product after delivery to correct faults, to improve performance or other attributes, or to adapt the product to a modified environment. The maintenance and the after purchase service offerings constitute an

important parameter for the customers. For the I-Box this constitutes a very important factor in determining the success of the product.

Possibility to Experiment:

This pertains to the market uncertainty, which is basically the inability of vendors and service providers to predict what users will like. The uncertainty exists partly because users often do not know what they want until they see it. The user when introduced to a new technology tends to view it in the context of the old technology being replaced. Consequently, user's expectations evolve along with the technology as they become more educated about the technology and what it enables. Thus, a possibility to experiment with the new product gives a sense of comfort for the end user [9].

Price:

Price is also considered to be a vital point in marketing where it is one of the four variables in the marketing mix that business people use to develop a marketing plan. Its importance is enhanced in a value adding device like the I-Box. As the I-Box is slated to be an inexpensive and easy to use device, so the variation in costs during procurement, delivery could also hold an important place during the deployment stage.

The Axiomatic table below shows the various parameters as perceived in various deployment scenarios:

	Weightage	Subscription Model	Retail Model	Online Model	Direct-to-Home Model
Cost Effectiveness	20%	3	2	2	1
Ease of Availability	10%	2	2	3	1
Aid and Advice	20%	2	2	2	3
Maintenance	20%	3	1	2	1
Possibility To Experiment	10%	3	2	2	1
Price	20%	2	2	2	1
Total	100%	15	11	13	8

Table 3: Axiomatic Table

6. RESULTS

In this section, an interpretation of the Analysis and their results is done, answering the basic question, what do the results in the analysis section mean in the context of the I-Box technology?

As already discussed in the previous sections, the four possible scenarios for the sale of the I-Box are:

- 1. Subscription Model:** This model has the maximum advantage of all the models from an end user perspective and is quite handy in that the Network operator bundles the I-Box subscription with the existing Mobile operator connection.
- 2. Retail Model:** This model is convenient for customers who know before hand the need and advantages of buying an I-Box. In this model, the customer/user buys the I-Box device from a retail outlet as per their convenience.
- 3. Online Model:** The Customer procures the I-Box online by logging onto an online web portal which sells the I-Box and is by far the most hassle free.
- 4. Direct-to-Home Model:** In this model, the customer can be reached by doing a door-to-door marketing for the I-Box. Though a good model, but it has its fair amount of limitations when compared with other models.

Why is Subscription Model the best?

From the complete analysis above and especially from the Axiomatic table, it is clear that bundling the I-Box subscription within the Subscription Model gives the best returns as it can be coupled with the existing ADSL/Mobile subscriptions is the best case scenario. The subscription model scores in the following parameters:

1. Cost Effectiveness
2. Maintenance
3. Possibility to Experiment

The subscription model offers the most cost efficient model for the end user as the relative costs and its outcomes fairly even out. It also easier to maintain from a end user perspective as the service offerings constitute an important part of customer psychology. Since it's a bundled subscription, it is a "one stop shop" for all the End users wants and needs.

It also gives enough room to experiment as a potential end user when introduced to a new technology might want to get more educated about the product and thoroughly understand what it enables. When given an opportunity to give a trial about the product with the help of subscription mode, it gives a degree of comfort for the customer.

While each scenario has its own strength/weaknesses to counter other business scenarios, but at the outset and taking various factors and an overall picture into account, the Subscription Model would be the most effective deployment marketing channel.

7. CONCLUSION

In this section, a conclusion of the work carried out is given. Firstly, a Summary of the total thesis is given, then an evaluation of the work and finally, possible future work is discussed.

7.1 Summary

This section summarizes the results of this thesis and gives a critical view on each of them. Then it explains how the results could be exploited, and finally suggests topics for further research in this field. There are mainly two important contributions of this thesis, which were to give a Technical overview of I-Box technology and also, to discuss the various possible deployment strategies for the I-Box.

In a nut-shell, I-Box is a very promising technology within the sphere of home networks. Its salient features can be summed up as follows:

- Unique capabilities, easy to use for a common end user
- Bluetooth Technology enabled
- UPnP capable
- Secure channel for communication

The Deployment strategy for the I-Box has been done with the help of various popular business models and detailed analysis of the various possible scenarios. The scenarios constructed in this thesis describe four possible deployment scenarios for the I-Box, which can be summed up as follows:

- Scenario 1: Subscription Model, I-Box bundled with the Service provider.
- Scenario 2: Retail Model, a Do-it-Yourself model wherein I-Box can be procured from a nearby Retail outlet.
- Scenario 3: Online Model, buying the I-Box online from web portals like eBay.
- Scenario 4: Direct-to-Home Model, procuring the I-Box directly from the Manufacturer.

Distribution channel decisions are amongst the most complex and challenging decisions facing the manufacturer. Each channel creates a different level of sales and costs. Once a firm chooses a marketing channel, it must usually remain with it for a substantial period. The chosen channel will significantly affect and be affected by the other elements in the marketing mix.

Based on the SWOT analysis of the possible deployment scenarios for the sale of I-Box and the Axiomatic Tabular approach, it could be interesting to note that each one of them have different perspective and have their own individual strengths to back it up, but holistically, the Subscription Model is the most favorable of all the models.

7.2 Evaluation of the Study

I-Box is a new technology and hence, would have its own set of strengths and weaknesses. The two major goals of this thesis were met. Firstly, giving an overview of I-Box and the technology involved and Secondly, perhaps more importantly, identifying the right deployment strategy for the I-Box.

The Geographic location also plays an important role, as the Labor costs vary and could be higher in the Western countries. Thus, this thesis assumes that the deployment scenario identified holds for a country where the Labor cost is at the higher end.

While the strength of I-Box lies in its ease of deployment for an end user, there is a threat also taking into account the rapid pace of development within the Home Networking technology. This I-Box might become obsolete as the future Home Network gateways might come with an inbuilt technology which satisfies all the requirements as done by the I-Box.

Since the self analysis is in most of the cases subjective, it is possible that some of the findings in the analysis might be biased as perceived by the writer or that some aspects are emphasized more while the others are left outside the analysis.

7.3 Possible Future work

Since the I-Box is a new technology, a feasibility study of the I-Box technology and its possible threats in the future could be interesting; an interesting aspect could be, with the rapid advancements in Home Networking technology would it be obsolete in the near future?

A thorough risk analysis of this new technology could be beneficial, as with a new product development risks like technology risk and market risk could be assessed [11]. These two are the most important, though other types of risks such as political risk could exist as well. Analyzing the technology if the I-Box is a potential disruptive technology would have good importance. Industry expert interviews could bring in new insight in this work.

Also, gathering more vital information on the existing Home Networks and measuring market demand for the I-Box could be interesting future work.

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