Chapter-3

Marketing of Innovations: Selected Case Studies

In continuation of the theoretical framework, some of the radical innovations have been studied in this chapter. These innovations are also called really new products. According to Urban et al. (1996) they are defined as “products which revolutionize product categories or define new categories”. These innovations were surrounded by a number of concerns and controversies which restricted their launch and posed hurdles to their spread. Challenge in front of marketers was not only to initiate the trial but to make the customer adopt the product. This chapter focuses upon the role of marketing strategies used by the promoters to initiate adoption and facilitate diffusion of these radically innovative products.

As discussed in chapter 1, biotechnology being an epoch making technology, these case studies are from the industries which have been assisted through this technology. Section 3.1 discusses the case of Assisted Reproductive Technologies. Section 3.2 deals with cosmetic surgery industry in India. Section 3.3 is focused upon GM crops and introduces GM cotton in the Indian context.

3.1 Assisted Reproductive Technologies (ART)

3.1.1 Introduction

It is estimated that 15 percent of couples around the world are infertile (The Assisted Reproductive Technologies Regulation Bill-2010). This implies that infertility is one of the most highly prevalent medical problems. The magnitude of the infertility problem also has enormous social implications. Besides the fact that every couple has the right to have a child, in India infertility also carries a social stigma.

With the enormous advances in medicine and medical technologies, today 85 percent of the cases of infertility can be taken care of through medicines, surgery and/or the new medical technologies collectively known as ART. These technologies have enabled
million of people in the world to have biological children who due to various medical reasons were not able to do so.

3.1.2 ART (Assisted Reproductive Technologies)-definition and techniques
It encompasses a variety of technologies, some used to initiate pregnancy, and others more specifically used to increase likelihood of pregnancy and/or to test for the presence of certain genes so prospective parents can choose which embryos to implant after in vitro fertilization (Galpern, 2007). There are three primary means of initiating pregnancy: alternative insemination (AI), prescription fertility-enhancing drugs, and in vitro fertilization (IVF).

Alternative Insemination (AI) (also known as Artificial Insemination): AI refers to several different procedures, all of which involve inserting sperm into a woman’s body, the differences referring to whether the sperm is placed in her vagina, uterus, cervix or fallopian tubes. AI can also be combined with hormonal drugs to stimulate production of multiple eggs to increase likelihood that one of them will be fertilized.

Cost for the sperm depends on several factors: whether using free sperm (from partner, friend, etc.), sperm bought through a bank; whether doing intrauterine insemination or intrafallopian insemination; and if using fertility drugs, ultrasound and blood work. If using a sperm bank, costs can also include registration and consultation, fertility awareness supplies, information about donors, and storage, packaging, and shipping.

Fertility-enhancing drugs: Fertility drugs can be oral or injectible. These can be used to assist natural pregnancy or combined with AI or IVF.

Success rates depend on many factors, especially maternal age and the quality of the accompanying sperm.

In vitro fertilization (IVF): it is commonly known as test-tube technology. IVF is one of the most invasive ART technique which is used when other methods do not succeed. In this method, fertilization takes place outside the woman’s body in which eggs (retrieved from the woman trying to get pregnant or from an egg donor) are fertilized with sperm (from a partner or donor) in a Petri dish.
3.1.3 Concerns around ART industry-

Assisted reproductive technologies have been available in India for the past 30 years, with the second test-tube baby in the world being born in Kolkata in 1978. According to Business standard, 2011, In India, it is estimated that around 30 million couples are infertile. Out of these, 80 per cent can be treated routinely with simple treatments. The rest, 6 million couples, need to undergo advanced infertility treatments like IVF, Intra-Cytoplasm Sperm Injection (ICSI), egg donation or surrogacy. Hence there exists a need for the use of these technologies in India. But their use has been associated with a number of social, financial, health related and ethical concerns. These concerns relate to the various stakeholders of the society namely- couples, their families, government, NGO’s and religious institutions. Some of these concerns are listed below-

1. There is a social risk attached to the use of ART techniques. There is an uncertainty regarding social acceptance of the couples and even children born out by these methods. Even some of the religious institutions condemn the use of these technologies and consider them as unacceptable.

2. Process of Selling of body parts as commercial capital is questionable.

3. There are concerns regarding health risks and side effects for the women using ART versus those conceiving naturally. Moreover, the impact on children born through ART also needs to be considered.

4. There is a lack of standardization in treatment protocol, such as the number of cycles, gap between cycles, etc. According to literature there is inadequate and piecemeal information about the treatment, procedures, drugs, side effects and overall costs available to the user customers. This paves the way for the exploitation of users, both physically and economically (Sarojini, Marwah and Shenoi, 2011).

5. There is a fear that the unethical and discriminatory practice of sex selective abortion may be promoted through these technologies.

In order to tackle these concerns and induce adoption of ART technologies, a complete market structure has been developed in the country. In this industry-Fertility clinics and
specialists, egg brokers, and sperm banks are the major parties that sell their services (Galpern, 2007). On one end, women and men wanting to have a child are consumers; on the other end, women and men participate in the service process as egg donors, sperm donors, and surrogates.

3.1.4 Marketing of ART

Fertility Clinics market their services through all major media forms, including web, newspaper, public transportation ads, and radio. An industry catering to fertility clinics’ marketing needs has emerged, providing publicity specifically for the fertility industry. Internet Health Resources has two parts to its business: one for consumers (Web site listings for products, clinics, services), and one for professionals (Web site development and promotion).

Market for eggs makes recruitment in three ways: through fertility clinics directly (egg donor program as part of clinic), “egg brokers” (recruit women to sell eggs to fertility clinics), and individuals (post in newspapers, online, etc.). Similarly there is a market for sperms too.

Marketing strategies used by ART industry in India-

1. **Advertisements through newspapers:** News reports also point to the increasing numbers of foreign clients at ART clinics, and the aggressive promotion strategies adopted by Indian ART providers. (Sarojini, Marwah and Shenoi, 2011). The images, language, and slogans used to promote ARTs serve to reinforce the 'tragedy' of childlessness and the sentimentality of childbearing, particularly motherhood, while deliberately ignoring, omitting, or playing down the concerns and complications that come with medical intervention, such as side-effects, efficacy, and costs.

2. **Promotion through websites:** A significant number of the ART clinic websites were found to have exclusive sections devoted to overseas couples. While the amount of space dedicated to this varies, almost all the websites try to seek
'clients' from abroad through promotion of 'medical tourism packages' and incentives, such as discounts and deals on services provided. These generally combine boarding, lodging and other facilities for enjoying the local tourist attractions alongside the ART 'treatment' schedules. Clinics in metropolitan cities like Delhi and Mumbai, where there is large influx of foreign couples and individuals for various ART services offer IVF cycles in packages that include excursions to nearby tourist attractions like the Taj Mahal, Jaipur palaces, and spas in Goa or Kerala etc.

3. **Package deals:** Clinics also offer schemes such as 'shared risk scheme', 'egg sharing scheme', and 'money back guarantee scheme', which reduce the treatment costs in ARTs. In the egg-sharing scheme, a woman undergoing IVF shares her eggs with another woman undergoing IVF in lieu of a reduction in the cost of her IVF cycles. This is becoming common even in clinics in smaller towns and cities. While packages and schemes benefit both the user and the provider of Arts, concessions, another feature, may be given at random by the provider to specific users. These are expressions of the providers' benevolence, which in turn earn them goodwill and help to spread word about their clinic.

4. **Free camps:** Yet another feature of the ART market is the organization of infertility camps by ART clinics, in line with camps for free health checkups, dental checkups, eye checkups etc that have been common in India. Now, ARTs have jumped on the bandwagon of this popular recruitment strategy. One clinic in UP held 'free infertility and IVF consultation camps' and provided special discounts on tests and procedures of IUI and IVF, if needed. These camps may be advertised in clinic websites, or local newspapers.

5. **Marketing through intermediaries and collaborations:** besides ART clinics, other emerging players in India include different types of organizations catering to clientele both at the national and international levels. These range from ART consultants, medical tour operators, surrogacy agents, the hospitality industry, and tourism departments to other organizations specializing in medical tourism.
promotion. Joint collaborations are coming up, wherein ART clinics in India have tied up with international hospitals and agencies to solicit clients globally. Some of these companies are headquartered in the United States or in other countries, from where the clients are sourced.

6. **Reproductive tourism** - Going to other countries for ART due to lower cost or less restrictive laws has given rise to an international market known as “reproductive tourism.” Besides China and Thailand, India, is the major country from where surrogates are hired by the individuals or couples from other countries that ban surrogacy or have strict regulation regarding the same.

United States has not produced much regulation in this area but payment for eggs is banned in some countries. The only two countries with comprehensive regulation that cover the use of all sperm, eggs, and embryos, whether for fertility or research, and apply to public and private ventures, are the UK and Canada.

Hence marketers of ART technologies used every trick in the book ranging from developing new market structures, using varied media to reach different types of audience and devising unique ways of promotion. The development of regulatory framework in the country has further legalized the issue and is expected to help in its adoption and diffusion.

### 3.1.5 Regulatory framework for the industry -

The National Guidelines for Accreditation, Supervision and Regulation of ART Clinics in India were released in 2005, jointly by the Indian Council of Medical Research (ICMR) and the National Academy of Medical Sciences (Bhan, 2008). This document is non-binding in nature. The requirement of the law was identified to achieve compliance with and enforcement of the guidelines. In 2008, the Ministry of Health and Family Welfare (MOHFW) and the ICMR (Indian Council of Medical Research) released the ART (Regulation) Bill and Rules 2008. This bill worked towards regulation but concerns regarding the health and rights of women users were not paid adequate attention. The
revised version of the bill was released in 2010. This draft Bill has taken some of the civil society concerns into consideration along with the other issues.

3.1.6 Adoption of ART technologies in India

Infertility market in India is growing at 24% annually. Of this, IVF is adopted by 70 %, AI by 22 %, and surrogacy by 7 %. There are over 300 IVF clinics all over India, mostly in the metro cities. Treatment has been offered in India by in-hospital IVF departments, and clinics/nursing homes run by single or multiple physicians. Ninety per cent of the market is still dominated by unorganized players. The total market size of infertility treatment in India is Rs 1,700 crore and is expected to reach Rs 14,000 crore in the next 10 years. Thus industry has been successful in influencing the society at large in convincing the use of the ART technologies. Marketing strategies used by the industry to affect adoption have been backed by the development of legal infrastructure in the country. These have collectively helped in creating the demand among the customers and diffusion of these technologies in the market.

3.2 Cosmetic Surgery

3.2.1 Introduction

Plastic surgery/Cosmetic surgery is usually performed to correct a physical abnormality or to enhance an otherwise normal physical feature and thus improve appearance. It is a broad field that may offer reconstructive surgery which is absolutely necessary to the health and well-being of the patient or improve the appearance and self esteem of the individuals. In this study we are focusing upon the Cosmetic surgery which is taken as a voluntary procedure for the enhancement of appearance through surgical and medical procedures. It involves reshaping the body parts that are otherwise functioning properly. It is also called aesthetic plastic surgery.
3.2.2 History of cosmetic surgery

The history of plastic surgery began more than 4,000 years ago. Reconstructive surgery techniques were being carried out in India by 800 BC. Sushruta, the father of Surgery, made important contributions to the field of plastic and cataract surgery in 6th century BC. The medical works of both Sushruta and Charak originally in Sanskrit were translated into Arabic language in 750 AD. In Gentleman's Magazine in 1794, the reports on Indian rhinoplasty (surgery for reshaping of the nose) performed by a Kumhar vaidya were published. Soon it spread to the other parts of the world.

Today there are a number of cosmetic procedures which are undertaken in India and across the world. The most prevalent aesthetic/cosmetic procedures include:

1. Abdominoplasty (tummy tuck): reshaping and firming of the abdomen
2. Blepharoplasty (eyelid surgery): reshaping of the eyelids or the application of permanent eyeliner, including Asian blepharoplasty
3. Chemical peel: minimizing the appearance of acne, chicken pox, and other scars as well as wrinkles (depending on concentration and type of agent used, except for deep furrows), solar lentigines (age spots, freckles), and photodamage in general.
4. Labiaplasty: surgical reduction and reshaping of the labia
5. Lip enhancement: surgical improvement of lips' fullness through enlargement
6. Rhinoplasty (nose job): reshaping of the nose
7. Otoplasty (ear surgery/ear pinning): reshaping of the ear, most often done by pinning the protruding ear closer to the head.
8. Rhytidectomy (face lift): removal of wrinkles and signs of aging from the face
9. Browplasty (brow lift or forehead lift): elevates eyebrows, smoothes forehead skin
10. Midface lift (cheek lift): tightening of the cheeks
11. Chin augmentation (chin implant): augmentation of the chin with an implant, usually silicone, by sliding genioplasty of the jawbone or by suture of the soft tissue
12. Cheek augmentation (cheek implant): implants to the cheek
13. Orthognathic Surgery: manipulation of the facial bones through controlled fracturing
14. Fillers injections: collagen, fat, and other tissue filler injections, such as hyaluronic acid
15. Laser skin resurfacing
16. Liposuction (suction lipectomy): removal of fat deposits by traditional suction technique or ultrasonic energy to aid fat removal.

In spite of the fact that these procedures have wide applications there are a number of concerns which restrict their adoption in India. These are given in the next section.

3.2.3 Concerns surrounding cosmetic surgery industry

1. There are concerns as to the appropriateness of use cosmetic surgery to help people conform to media messages of what is considered beautiful. According to Avinash De Sousa (2007), given that the beauty is defined by the culture dominant within a society and it is questionable whether cosmetic surgery should be used to change ethnic traits.

2. There is lack of guidelines on the use of cosmetic surgery on children and teenagers. Moreover, there are questions as to the age of consent for these procedures. Hence the fear of exploitation prevents people from trying the procedures.

3. Body Dysmorphic Disorder is tied to the psychological aspects of plastic surgery. People suffering from this are considered as "plastic surgery addicts". It is estimated to affect 1-2% of the world's population.

4. There are various types of risks associated with cosmetic surgery. Most common to each form of surgical procedure are medical and health risks. There are risks as to the social acceptance of the individual after the surgery. This can have an impact on the emotional state of the individual leading to post operation depression.
But these concerns have been taken care of while designing the marketing strategies for cosmetic surgery industry.

3.2.4 Marketing strategies used by the industry

1. **Use of variety of media**- According to the literature, magazine advertisements (Hennink-Kaminski, 2006), yellow pages advertisements (Spilson et al., 2002), and websites (Francis et al., 2006) are used extensively by the industry to spread awareness and to educate the customers about these products. In India print advertisements through newspapers and magazines is used for national advertising. Articles advertorials, testimonials are used and promoted through print. Various kind of rational as well as emotional appeals are used to lure the customers. Radio and outdoor media like hoardings, kiosks etc are also used for local advertisement.

2. **Special offers for Indian working class**- For the working professionals in India, non-invasive or superficial surgeries are advertised and promoted as ‘lunch-time lifts’. These can be performed through local anesthesia and show results immediately. These include Botox, fillers, peels and laser hair removal.

3. **Promotion through Medical Tourism**- The cosmetic surgery has been promoted as a part of medical tourism. An increasing number of foreigners, mainly from the European countries, US, Middle East, Asian and African countries are visiting India for getting their cosmetic surgery done because of lower costs and satisfactory services provided here. A report published by the Planning Commission of India shows the huge cost advantage of India in cosmetic surgery. In general, a plastic surgery procedure that will cost $20,000 in the U.S. and $10,000 in Britain will be $3,500 in Thailand and only $2,000 in India. Besides cost-competitiveness India also has a unique advantage that could catapult it ahead of its peers Thailand or Singapore. It is its tradition of Ayurveda and yoga, both Indian-origin practices that are now being perceived the world-over as complementary rehabilitative practices to modern surgical procedures. These
clients have been targeted through Website promotions and packaged deals. Website promotions appeal to the national and international audience but there are sections devoted to foreign customers. Packaged deals launched by skin clinics are especially customized for the tourists and NRI's coming to the country. For example- Kaya also offers combination package (Botox and fillers) during winter months when a number of NRIs return home. Kaya skin clinic holds coffee mornings at embassy consulates in Delhi, Mumbai and Bangalore with an aim to target the expat crowd.

4. **Marketing efforts by cosmetic clinics as well as individual plastic surgeons**-
Marketing plays an important role in the promotion of this sector due to the fact that the cosmetic procedures are elective compared to procedures in other medical specialties (Spilson et al., 2002). Plastic surgeons need to contact potential patients through their own efforts and persuade them that they would benefit from the procedures (Hennink-Kaminski, 2006). For this reason, plastic surgeons’ advertising is perceived as an important tool for their economic survival. Moreover, most cosmetic procedures are not covered by health insurance which means that the plastic surgeons derive their profits from the number of patients they recruit for surgery or other procedures (Spilson et al., 2002; Sullivan, 2001). One researcher called the phenomena in which many physicians and clinics advertise their specialties a “medical marketing revolution” (Sullivan, 2001, p. 85).

Hospitals and clinics also expanded their services in order to cater to the Indian market and foreign clients. For example Apollo Hospitals Group is expanded its cosmetic clinics to Delhi, Kolkata and Ahmadabad in addition to its clinics in Chennai and Hyderabad.

5. **Transforming the concept of beauty**- The Victorian belief that beauty radiated from internal goodness morphed into the modern, secular idea that every woman could be beautiful if she bought the new products and services offered by the burgeoning beauty industry (Sullivan, 2010). As fears about surgical risks
declined, cosmetic surgery became one of these services. This was done by giving direct and indirect messages through media and hence resulted in the emerging consumer culture which placed great value on acquiring good looks. This was boosted by the innovations in print photography and motion pictures which created new standards for judging appearance.

As a result of all these efforts made by the industry and advocacy of practice in the media, there is an increase in the demand of cosmetic surgery. According to an international survey conducted by the International Society of Aesthetic Plastic Surgery (ISAPS), India has been ranked fourth with 894,700 surgical and non-surgical cosmetic procedures in 2010, accounting for 5.2 per cent of all procedures done worldwide. Nearly 60,000 patients come to India every year for various medical procedures and the cosmetic segment accounts for 10% of this market. Hence India is a known name in the world cosmetic surgery market.

3.2.5 Adoption of cosmetic surgery in India

There is an increasing demand for aesthetic procedures from people in the urban cities of Mumbai, Delhi, Kolkata, Chennai, Bangalore, Pune and Chandigarh. Cosmetic surgeries in India were associated with celebrities and people of the affluent class at a point of time, but nowadays middle class too has started adopting these procedures. One of the major reasons for the adoption of cosmetic surgery has been the increased consumer awareness resulting from the efforts of the media - especially the print media. Besides this other factors like- direct marketing and advertising campaigns and technological advances in surgical and non-surgical procedures also contribute to the high growth of the cosmetic surgery market in India.

The value of cosmetic surgery market in India (Rs 240 Crore) and its growth rate (40% per annum) clearly point to its adoption and diffusion in the country. According to the latest research report by RNCOS (2009-2012) on Indian cosmetic sector, the cosmetic surgery market in India is expected that the Indian cosmetics surgery market will grow at a CAGR (Compound Annual Growth Rate) of around 31% during 2010-2013.
These cases clearly reflect the fact that in case of radical innovations, marketing strategy needs to be built in a way as to shift market structures, induce consumer learning and implement behavioral changes. These changes will then result in the adoption and diffusion of radical innovations. In both the cases discussed here, despite the fact that the product service tend to fulfill important latent needs of the market, it was the promotional strategy which made them socially acceptable. Over the time, these products/services have become accepted and even encouraged in some circles. One of the important radical innovations in the arena of agriculture has been genetically modified crops.

3.3 GM crops- An introduction
A transgenic crop plant contains a gene or genes which have been artificially inserted through genetic engineering techniques instead of the plant acquiring them through pollination. The inserted gene sequence may come from another unrelated plant, or from a completely different species. Plants containing transgenes (other than naturally occurring original genes) are often called genetically modified or GM crops. GM crops carry the gene introduced in them to express desired beneficial, new, stable or inherited traits.

3.3.1 Evolution
Japanese biologist, Shigetane Ishiwatari was investigating the cause of the sotto disease (sudden-collapse disease) that was killing large populations of silkworms when he first isolated the bacterium *Bacillus thuringiensis* (*Bt*) as the cause of the disease in 1901. Ernst Berliner isolated a bacterium that had killed a Mediterranean flour moth in 1911, and rediscovered *Bt*. He named it *Bacillus thuringiensis*, after the German town Thuringia where the moth was found. Ishiwatari had named the bacterium *Bacillus sotto* in 1901 but the name was later ruled invalid. In 1915, Berliner reported the existence of a crystal within *Bt*, but the activity of this crystal was not discovered until much later. Farmers started to use *Bt* as a pesticide in 1920. France soon started to make
commercialized spore based formulations called Sporine in 1938. Sporine, at the time was used primarily to kill flour moths. In the US, Bt was used commercially starting in 1958. By 1961, Bt was registered as a pesticide to the EPA.

Research on developing insect resistant transgenic crops was initiated to offset some of the disadvantages of Bt based biopesticides (Sastry et al., 2011). Cotton was one of the first crops where this feature was exploited to develop insect resistant crops. Genetic modification was used to introduce Bt gene into the plant. The cotton variety so developed produces the toxin in all the parts of plant such that major insect pests of cotton are controlled. When bollworms feed on the Bt cotton plant, the protein stops the larvae from feeding further and causes its subsequent death (Ramanna, 2005). Thus it reduces the need for pesticide sprays for bollworms and improves the productivity of cotton crop.

In 1990 the first Bt protected cotton crop was field tested in USA. After verification and examination of safety and suitability of this crop by various government regulatory agencies of USA, Bt cotton was commercialized. It was cultivated on 1.8 million acres in 1995. In 1997, china took the cultivation of Bt cotton followed by 13 other countries. In March 2002, Bt cotton was officially released in India. Till now it is the only GM crop permitted for commercial cultivation in the country.

At present, several transgenic cotton (GM cotton) varieties are commercialized throughout the world. They are:

1. **Bt or insect resistant (IR)** - it is also called Ingard cotton. It contains a gene from the soil bacteria Bacillus thuringiensis (Bt), which allows the plant to produce the Bt protein which kills cotton’s major pest, heliothis or the cotton bollworm, when it eats the leaves. Bollgard II differs from Bt cotton in that it contains two, rather than one, genes from the soil bacteria Bacillus thuringiensis (Bt). The genes produce proteins in the leaves of the cotton plant and when cotton’s major caterpillar pest eats the plant, it dies.

2. **Herbicide Tolerant or Herbicide Resistant (HT or HR)** - it is called Roundup ready cotton. The Roundup Ready characteristic makes the cotton plant resistant to the
herbicide glyphosate. Herbicide tolerant crops are not harmed by the herbicides applied to the weeds around them, providing growers with greater flexibility in weed control options.

3. **Stacked Gene cotton (SG)** – it is also called Roundup Ready Bt cotton. Roundup Ready/Bt cotton was achieved through conventional breeding of the two GM varieties. It combines the traits of insect resistance with herbicide resistance.

Out of these only insect resistant Bt-1 and Bt-II are cultivated in India.

### 3.3.2 Benefits of GM crops -

1. **Benefits for the final consumer** - enhancement of the nutritional value, taste and quality and durability of foods. Products with unique nutritional combinations can be made. New products like Golden rice (in which gene synthesizing beta carotene is introduced and hence its ability to provide Vitamin A) can provide the solution to the problem of malnutrition. Moreover due to the improvement in yields and reduction in costs, the prices of the final products can also be reduced. Further GM crops claim to reduce world starvation due to increased production.

2. **For the Producers** - there is an improvement in the agronomic traits like tolerance to specific herbicide and resistance to pest and diseases. This has led to the improved productivity for the producers in the form of savings in labor cost, factor cost and time. Development of crops that can be cultivated in extreme environmental conditions. And crops with improved traits like higher yield, stress tolerance and Decrease of maturation time of the plants (so they can be harvested sooner and more often during the year) also added to their profitability

   Increase in the shelf life of the perishable products has also helps in reducing the post-harvest losses. This provides for the better marketing opportunities for the resource poor farmers of the developing countries who have lack of proper transportation facilities and insufficient refrigeration system.

3. **Environment** - Reduction in application of pesticides and insecticides. This helps in conserving the environment and controlling the pollution hazard. Moreover,
through genetic engineering, environmental friendly bioherbicides and insecticides can also be produced.

Efficient weed control helps in maintaining a sustainable cropping system through no or low tillage practices which leads to less soil erosion.

It is expected that GM crops can reduce the need for deforestation through efficient crop management.

3.3.3 Concerns surrounding GM crops

There are a number of debates related to the prospect and risks associated with the GM crops. These concerns equally apply to the GM cotton as well.

1. Environmental concerns relate to potential impact of GM crops on the environment. There is an issue of unintended transfer of genes through cross-pollination resulting in loss of flora and fauna biodiversity and threatening the natural ecosystem. The foreign genes might escape into the other varieties and non-target species leading to gene pollution and contamination of genetic resources. GM crops can develop resistance in the pests and may hasten their co-evolution.

Cultivation of herbicide tolerant GM varieties can boost herbicide application in the field leading to environmental pollution. Moreover, large scale cultivation of transgenic crops might bring the risk of reduction in biodiversity though squeeze in varietal and crop diversity. Moreover, there are unknown effects of GM crops on the birds, insects and other non target species that come in contact with it or consume it.

2. There is a risk of Potential human health impacts, including allergens, transfer of antibiotic resistance markers etc (Singh, 2010).

A key ethical concern about GM foods is their potential to trigger allergies or disease in humans. Given that a gene could be extracted from an allergenic organism and placed into another one that typically does not cause allergies; a
person may unknowingly be exposed to an allergen. In turn, this could lead to an allergic reaction.

Moreover, there could be new allergies occurring from the mixing of genes from two organisms. Disease is a major health worry with regards to GM foods. Given that some of the crops modified are done so with DNA from a bacterium or virus, there is concern that a new disease may occur in humans who consume the GM food. With some GM crops having antibiotic-resistant marker genes, there is also the worry that these genes could be passed on to microbes that cause disease and health problems in humans. With widespread antibiotic resistance currently already occurring, any new resistance could prove disastrous.

These concerns relate to the GM cottonseed oil also as it is consumed in large quantities throughout the world.

3. The fact that GM technology involves mixing of the genes among species gives rise to the ethical questions related to the violation of natural organism’s intrinsic values. It is propounded that this modification causes stress for the processed organism. Further there are ethical and societal issues related to the consumption of animal genes in plants.

4. Issues related to intellectual property- patenting living organisms are linked to fears that biotechnology will transfer resources from the public sphere to private ownership via the enforcement of intellectual property rights. This may lead to the domination of world food production by a few companies, increased dependence on industrialized nations, foreign exploitation of natural resources and theft of genetic materials by patent process (biopiracy).

5. Economic concerns- these are related to the affordability of GM seeds by the farmers worldwide. Due to the fact that the technology is patented, the cost of seeds is high compared to non transgenic varieties. Moreover, recycling of GM seeds is not profitable and hence repeated investment is needed each year in order to procure them.
6. Political and legal concerns- the government is concerned with the workplace health safety and wellbeing of the workers associated with this industry (biosafety). Another issue is of biosecurity that is the state’s preparedness against misuse of biological pathogens and toxins and prevention of biocriminal and premeditated bioterroristic activities. These chemicals could be used to instill fear in and to terrorize the population (Sliva, 2005).

GM crops represent a typical case of radical innovations where in spite of a number of concerns, controversies and issues, the technology was adopted widely across the globe. According to ISAAA Brief No. 43, 2011, there is a 94-fold increase from 1.7 million hectares in 1996 to 160 million hectares in 2011 under GM crops. This makes biotech crops the fastest adopted crop technology in recent history. With the world population projected to reach 8 billion by 2025, declining crop yield and a poor growth of agricultural output, this technology promises to raise productivity, ensure food security and protect environment. This technology acts at basic sustenance level and promises to revolutionize the agriculture. In spite of a number of concerns and controversies around the GM crop technology, there are 29 countries cultivating 13 GM crops. Out of these GM cotton is one of the principal Biotech crop which is being cultivated in 13 countries. Even in India, Bt cotton (a variant of GM cotton) has completed its ten years of launch in year 2011-12. In fact it is the only crop legally permitted for commercial cultivation in the country. It occupies 88.4% of total area under cotton production in the country in 2010-11. This study is designed to look at the ways as to how the marketing strategies inhibited or propelled the adoption of GM cotton. Hence GM cotton (Bt cotton in India context) has been chosen to develop the framework for marketing of innovative products. In order to look at the factors which affect the adoption of GM crops, literature review has been carried out in the next chapter.