CHAPTER 3
THEORETICAL FRAMEWORK

3.1 GENERAL

This chapter presents the theoretical framework for the study of science communication through radio. From the survey of prior studies discussed in the previous chapter, this work proposes a research model for the study. The review of literature has broadly shown us the contours of science communication and its concerns about communicating or sharing or discussing science to or with or among the people. The theoretical framework of a study is a structure that can hold or support a model of a research. The model explains why the problem under study exists. This chapter contains two sections: science communication models with examples and the relevance of these models for the present study. It also takes a participatory approach to study the mainstream media and alternative media.

3.2 SCIENCE COMMUNICATION MODELS

The study begins with a discussion of communication models, arguing that these models need to be clarified and distinguished more carefully from each other.

In the communication era, there have been moves towards active participation of the people in shaping their societies. There have been shifts from the top-down approach of communication to a more participatory
approach. Initially, projects were initiated and planned by the so-called professionals in their offices without consulting the people at the grassroots.

The top-down approach led to the mushrooming of schools, clinics and other projects which were decided upon by these professionals. Most of such facilities meant for the population were left unused. Science communicators have initiated various campaigns without consulting target audiences. Radio programmes, posters and other science promotions have adopted the top-down approach. Parker (1994) lends weight to the argument by stating that:

Generally speaking, the predominant method for the production of health education materials incorporates a somewhat top-down approach where health professionals, in collaboration with media professionals develop media products (p. 64).

Science communicators have erred by setting the agenda themselves without the consent of the people for whom the messages were intended. Most professionals even today use the old approaches to communication. The top-down approach to communication and development can be traced back to Harold Lasswell as well as Shannon and Weaver (Mthembu 1995).

The disadvantage with this model is that the communicator is seen as having the power to influence the recipients or receiver of a message. It further operates from the premise that communication is a persuasive process. Its shortfall is that there is no feedback; communication is from the sender to the receiver and is, therefore, a one-way process. Moreover, the audience cannot ask questions on whatever subject under discussion.
Another model which surfaced in 1949 was the Mathematical Theory of Communication by Shannon and Weaver. Under this model, the information source produces the message which is then communicated to the intended audience. The message is then conveyed into a signal by the transmitter. The channel is the medium which transmits the signal from the transmitter to receiver and the destination is the person the message is intended for. About the appeal of these models, Parker (1994) says:

Such models easily engender popular credence, for, on the surface, they offer a logical appeal to what is surely a popularly held view – that communication is about how effectively communicator transfers messages to a receiver (p. 38).

Shannon and Weaver’s linear source-transmitter-channel-receiver-destination model eclipsed the earlier, more organic, psychological and sociological approaches. Harold Lasswell, Hofland, Schramm, Westley and MacLean, David K. Berlo and others each devised a model of communication as they conceived it. This profusion of communication models may be attributed to these reasons given below.

Firstly, because they identified communication as the transfer of information (the stimulus), they were amenable to empirical methodology, thus establishing the basis for communication as distinct and legitimate science. Secondly, the theorists focused on the efficiency or effects of communication (the response), thereby holding vast promise for manipulation or control of message ‘receivers’ by vested interests or the ‘sources’. Finally, the communication models fitted neatly into the nature and the mechanics of mass or mediated communication, an emergent and powerful force at that time (Fisk 1982; and cited in Servaes and Malikhao 2005).
For all of these models, it may be asserted that radio is an important medium. It is the manifestation of the dialogue and voices of people. The various kinds of information pertaining within the realm of scientific relevance would help the masses to get acquaintance with the everyday science. Many of studies have illustrated people’s perception of the programmes and the appropriateness of radio in disseminating the needed clarification and the scientific knowledge to the people in various comfortable formats. So the systematic perusal of the literature has accentuated the need to evaluate the effectiveness of radio in communicating science information to the people. In this context, a suitable model to evaluate the effectiveness is an important issue. The literature has facilitated the expansion of the earlier models, including the participatory approach.

3.2.1 Four Major Science Communication Models

A great deal of theoretical and practical work has been done with regard to (science) communication models. The traditional views of the science communication models present the communication gap between science and the public as an inevitable consequence of the progresses in science and technology. Moreover, this indirect correlation between the scientific and technological developments and public understanding of science calls for the mediators to transmit information in a one-way flux, stemming from the scientists to the receptive public by simplifying its language (Bensaude 2001).

Previous research on models of science communication has identified a number of models that might apply, including one-way versus two-way, asymmetric versus symmetric, and deficit versus contextual models (Davies 2008; Sturgis and Allum 2004; Grunig and Grunig 1992; Grunig and Hunt 1984).
The four major models of science communication are deficit model (monologic and asymmetric), contextual model, lay expertise model and public engagement model (dialogic and symmetric). The diffusion of innovations and the participatory approach are explained under the deficit model and the public engagement model respectively.

Surveys for the National Science Board in the 1970s attempted to measure public knowledge of and attitudes towards science and technology (Miller 1983a, 1983b; and cited in Lewenstein and Brossard 2006). These surveys resulted in measures of ‘science literacy’ that show, depending on the year and the particular method of interpretation, that only 5% of the American public is scientifically literate, and only 20% are interested and informed. The rest, by formal definition, are ‘residual’ (National Science Board 1991; and cited in Lewenstein and Brossard 2006).

The studies have led to cries about the lack of knowledge, and then to new programmes for providing information to fill the gap of knowledge (Royal Society 1985; National Commission on Excellence in Education 1983; and cited in Lewenstein and Brossard 2006). This approach has become known as the ‘deficit’ model, since it describes a deficit of knowledge that must be filled, with a presumption that after fixing the deficit, everything will be ‘better’ (whatever that might mean) (Ziman 1991; and cited in Lewenstein and Brossard 2006).

However, scholars have identified a series of difficulties with the deficit model. Most notably, many of the questions are asked without providing a context (Wynne 1995; and cited in Lewenstein and Brossard 2006).

Research has shown that communities understand highly complex technical information that concerns them, such as water quality problems
(Fessenden-Raden, Fitchen and Heath 1987; cited in Lewenstein and Brossard 2006). There has been little attention to other forms of knowledge that may be relevant to individuals in their real, everyday lives (Irwin and Wynne 1996; and cited in Lewenstein and Brossard 2006).

Studies by Wynne, Irwin, Latour, Collins, and Pinch, Jenkins, Layton, Yearley, McGill and Davey promoted a new model that became known as the contextual approach (Miller 2002):

The deficit model is asymmetrical: it depicts communication as a one-way flow from science to its publics… (whereas) the contextual model explores the ramifications of its very different root metaphor; the interaction between science and its publics. In consequence, the contextual model is symmetrical: It depicts communication as a two-way flow between science and its publics. The contextual model implies an active public: it requires rhetoric of reconstruction in which public understanding is the joint creation of scientific and local knowledge … In this model, communication is not solely cognitive; ethical and political concerns are always relevant (Jenkins 2003).

Wynne (1989) says that the lay expertise model begins with local knowledge, sometimes called ‘lay knowledge’ or ‘lay expertise’. The lay expertise model argues that scientists are often unreasonably certain – even arrogant – about their level of knowledge, failing to recognize the contingencies or additional information needed to make real world personal or policy decisions. Basing their analyses largely on case studies (Irwin and Wynne 1996; and cited in Lewenstein and Brossard 2006), proponents of a lay knowledge approach argue that communication activities need to be structured in ways that acknowledge information and knowledge and
expertise already held by communities facing scientific and technical issues (Wynne 1996; and cited in Lewenstein and Brossard 2006).

However, unlike approaches to indigenous knowledge systems that attempt to use modern science methods to verify traditional beliefs, the lay expertise model is explicitly targeted to valuing local knowledge as expertise in their own right (Grove-White et al 1997; and cited in Lewenstein and Brossard 2006).

The public participation activities are often driven by a commitment to ‘democratizing’ science – taking control of science from elite scientists and politicians and giving it to public groups through some form of empowerment and political engagement (Sclove 1995). A ‘public engagement’ model has emerged, focusing on a series of activities intended to enhance public participation in science policy. These activities include consensus conferences, citizen juries, deliberative technology assessments, science shops, deliberative polling, and other techniques (International Science Shop Network 2003; and cited in Lewenstein and Brossard 2006).

It may be noted that these four models are not the result of individual effort but rather the product of collective research. The characteristics, merits, demerits of all these models are discussed in the following subsection.

3.2.1.1 Deficit model

The first attempts on communicating science to the public had a top-down approach; it consisted of scientists (or mediators) spreading information among the public that suffered from a huge knowledge gap. It was known as the deficit model (Burns 2003). The deficit model states that negative attitudes about science are primarily due to a deficit of knowledge about the scientific method or the facts discovered by the use of that method.
This model is associated with a corresponding view that increased education will lead to more positive attitudes: ‘to know science is to love it’ (Turney 1998). This deficit approach which lasted until the late 1970s, builds on a sender-receiver model taken from communication sciences. The sender was the scientists and producers of genuine scientific knowledge (Arca 2004). The assumption that it is a lack of public understanding or knowledge that has led to the present climate of scepticism toward science underpins what has come to be known as the ‘deficit model’ (Layton et al 1993; Wynne 1991; Ziman 1991).

The characteristics of a deficit model are the following:

- One-way transmission of information
- Communicating science to the people
- People’s lack knowledge of science which needs to be popularized
- Participants: scientists, science communicators and content producers.

This model is successful when the knowledge transmitted is relevant to the people. Otherwise, it may receive a hostile response. The hierarchy in the model interprets the scientific knowledge as clearly distinguishable from the folk-knowledge and favours its superiority due to its specific form of rationality. As a result, expert status was only in the hands of the scientists where the emotional and simple character of public knowledge should be ignored with a unidirectional model of communication. In fact the public, whose knowledge was ignored, was being conceptualized as being ignorant to the scientific knowledge. Moreover, this ignorance and lack of information could cause fear and alienation from science. Therefore, large information and education campaigns were carried out to impose the importance and value of science in society (Felt 2003; and cited in Arca 2004).
In imparting literacy and skills, this model is considered to be useful. For instance, the following study by Jayaprakash (2006) shows the merit of the deficit model. In his study of the radio listening habits, it was found that the audience were hungry for developed-related information and it is a major responsibility of broadcasting organizations in a development country like India. Its primary function is to carry information on agriculture, health, population control, etc., to the rural masses. Radio was found to be the true mass medium for communicating development related messages. Local radio stations are designed to cater to needs of the people. In Nagercoil, which belongs to Kanyakumari district of Tamil Nadu, about 91% of the respondents listen to the radio. Generally, the medium is tuned for information and entertainment. The researcher concluded that among the respondents, radio got the highest exposure. It was found that the listeners were expecting more educational programmes followed by local information and agriculture programmes in appropriate formats.

However, the deficit model may fail if the content is inappropriate or if the audience is callous. Gross (1990) was critical of the deficit model, whose assumption of public ignorance implies a rhetoric of accommodation that adjusts the complexities of the sciences to the intellectual limitations of their non-scientific publics. It follows that the status of public understanding is epistemologically diminished. Moreover, even at being the most responsible and useful, the deficit model, by casting the public in a passive role, endorses political quietism. This quietism is reinforced because the deficit model marginalizes, indeed its rhetorics of accommodation actually mask, the ethical and political implications of science.

Rogers (1962) came up with his diffusion of innovations to strengthen the deficit model. However, a researcher will have to take care in using this model especially when he/she deals with South Asian science
communication projects as its culture is diverse and includes a number of developing countries like Nepal, Sri Lanka and India.

Nearly 100 years ago the community of American farmers started using a new hybrid strain of corn. The way this technology diffused through the farming community followed a predictable pattern, according to researcher and writer Rogers (1983). From the explosive uptake of the Walkman to the slow but eventually thorough adoption of the fax machines, Rogers’ theory has become known as part of the Diffusion of Innovations – DoI – theory and has been applied widely (e.g., Geroski 2000; Holloway 1997; Lawson and Loudon 1996; Mahajan and Peterson 1985). According to the DoI model there are predictable patterns of communications among community members as a new technological innovation diffuses.

The different stages that the innovation passes through are:

- knowledge (understanding of its functions and exposure to its existence)
- persuasion (the forming of a favourable attitude to it)
- decision (commitment to its adoption)
- implementation (putting it to use)
- confirmation (reinforcement based on positive outcomes from it).

The innovation is actually unchanged, but the community reacts to it in different ways. The early ‘knowers’, for example, are regarded as having a higher social standard and being better educated. The awareness of people is high and likely to use both channels of mass communication and also interpersonal ones. Later at the persuasion stage, channels of interpersonal communication are regarded in the DoI as more important.
3.2.1.2 Contextual model

Contextualists, by contrast, hold that “other knowledge domains… influence attitudes toward science and technology in opposite or conflicting ways to factual scientific knowledge” (Sturgis and Allum 2004), and that these other domains play at least as important a role in determining one’s attitudes toward science as scientific knowledge itself does.

The contextual model acknowledges that individuals are not empty vessels ready to be filled with information, nor are they passive receivers. They process information according to social and psychological ideas that have been shaped by their previous experience, cultural context and personal circumstances (Lewenstein and Brossard 2006).

The characteristics of a contextual model are:

- Two-way consultation of applications
- Communicating science with the people
- Diverse needs are recognized
- People’s rights are respected and balanced with responsibilities
- Participants: scientists, science communicators, content producers and respondents.

Contextual models recognize the presence of social forces, but nonetheless focus on the response of individuals to information; they highlight the psychological components of a complex social psychological setting.

This contextual model is successful when the knowledge consultation is relevant to the people. Otherwise, they have diverse needs and
we recognize them. In the context of applications, this model is quite useful. The contextual model avoids the difficulties of the deficit model. In this model, public understanding is the joint product of scientific and local knowledge. The following study titled Kothmale project shows the merit of the contextual model. Information forms the basis to create awareness, though awareness to action calls for an integrated approach to development. For instance, the Kothmale project in Sri Lanka experimented with Internet browsing through radio. Here the questions of the listeners are searched in the internet and the answers translated into the local language and contextualized by volunteers, and then broadcast. The project expanded the knowledge base. This project had opened up new job opportunities for the rural youth. It had also increased the level of educational achievements among students. By encouraging community participation, the project had strengthened the community bonds. Government websites constantly updated the content to augment database constantly accessed and transmitted over radio. Thus the project helped to build e-governance too. Technology was demystified so that all could share its benefits. The people also took part in the management of the station and had a say in the scheduling and programming. The individualistic medium of computer / internet (normally used only by the elite) is here made a collective medium for the masses.

These success stories, however, do not mean that the contextual model is faultless. It is bound to fail when the audience turn hostile to ideas and innovations that challenge their culture and deep beliefs. It may be pointed out that the contextual model advances the cause of the deficit model by seeking the cooperation of the target audience without any change in the agenda of science dissemination.

Contextual models have been criticized for being merely more sophisticated versions of the deficit model: they acknowledge that audiences are not mere empty vessels but nonetheless conceptualize a ‘problem’ in
which individuals respond to information in ways that seem inappropriate to scientific experts (Wynne 1995). The recent use of marketing and demographic approaches has also raised concern that contextual model research is intended as a tool for manipulation of messages to achieve particular aims; the goal might not be ‘understanding’ but ‘acquiescence’.

In response to deficit and contextual models, researchers expressed concern (Lewenstein and Brossard 2006) that perspectives for exploring public communication of science and technology were too tied to the interests of the scientific community, which almost by definition constitutes an elite group in society. Deficit and contextual models often seem to equate ‘public understanding of science’ with ‘public appreciation of the benefits provided by science to society’ (Lewenstein 1992). They do not adequately address the social and political context in which the powerful social institutions of science use ‘science literacy’ as a rhetorical tool to influence funding and policy decisions (Hilgartner 1990), sometimes in political opposition to labour or local interests. Since the mid 1980s, these researchers have stressed the importance of recognizing local knowledge and commitments to political inclusion and participation. From these concerns have emerged two new models: lay expertise and public engagement.

3.2.1.3 Lay expertise model

Lewenstein (2003) says the lay expertise model does not see scientists as the only people who can solve problems, but assumes that local knowledge may be just as important. Heavily influenced by social psychology, pedagogy and educational philosophy, its purpose is to involve the public to get to better knowledge building and understanding. Knowledge cannot simply be transferred, but at its best be shared. Knowledge evolves from interaction between people and their surroundings, and from that angle one can say that knowledge is not a firm fact but a social construct.
The lay expertise model begins with local knowledge, sometimes called ‘lay knowledge’ or ‘lay expertise’ (Wynne 1989).

The characteristics of a lay expertise model are:

- Emphasis on indigenous knowledge
- Sharing science with the people
- Limitations of modern science acknowledged
- Non-scientists play a prominent role
- Participants: local science communicators, content producers and people.

Some community radio stations are based on the lay expertise model. Since the programmes are for the people, by the people and of the people, most of the experiments in community radio have been successful. The following is a classic textbook example for the lay expertise model:

Women of Machnoor village wished to have a community radio station. The Deccan Development Society, instead of running a radio station themselves, decided to train two women in operating the systems. After providing the necessary infrastructure, they asked them to become radio jockeys (RJ) and choose the form and content and the kind of programmes they wanted for their community. Algole Narsamma and G. Narsamma became the first women radio anchors and RJs here. Now they have trained at least 12 other women. Their community radio called ‘Radio Sangham’ works very differently from regular radio stations. They use only local dialect, which is a mixture of Telangana Telugu, Kannada, Marathi and Urdu. When the women are not broadcasting on the radio, they work as farm labourers.

“It is operated and managed entirely by the community. We do not call experts or specialists from outside. Our problems and issues can be best
understood and addressed by people from within the community, so we call experienced elders. It ensures that our listeners immediately identify with the speaker who may be their neighbour and speaks the same language,” says G Narsamma of the media station (Janyala 2012).

Like the other models, the lay expertise model is also not without its drawbacks. It is not clear how a model of public understanding based on lay expertise provides guidance for practical activities that can enhance public understanding of specific issues, although it suggests that activities designed to enhance trust among participants in a policy dispute are more important than specific educational or informational approaches.

Moreover, the lay expertise model is not completely free of external interventions. The technology comes from outside and trainers come from outside. Many community radio stations are also run by outside experts.

3.2.1.4 Public engagement model

The public engagement model, in which the public participates in the policymaking and decision-making processes, by focusing on a series of activities intended to enhance public participation, hereby democratizing science and gain trust in science policy (Mol 2011).

A ‘public engagement’ model has emerged, focusing on a series of activities intended to enhance public participation in science policy. These activities include consensus conferences, citizen juries, deliberative technology assessments, science shops, deliberative polling, and other techniques (International Science Shop Network 2003). The public engagement model is sometimes called the ‘dialogue’ model and is intended to highlight the importance of seeking public input into science issues, without necessarily yielding control (House of Lords 2000; Miller 2001).
The characteristics of a public engagement model are:

- Multi-directional networking
- Communicating science *among* the people
- Wide public participation in policy process
- Science communicators and the people set the agenda
- Participants: policy-makers, scientists, science communicators, content producers and people (mostly as respondents)
- Builds mechanisms for engaging citizens with science – simple interaction between citizens and scientific experts, citizens’ empowerment, real public authority over policy.

Trench (2008) pointed out: “Citizens’ participation implies the existence of opportunities to accede to and appropriate scientific contents and reliable information, as well as be involved in decision-making on public policies and in social debates on these subjects.” He went on to add: “The crux of the matter is getting civil society to take part in the process of decision-making.”

Chapman et al (2003) said that their experience with rural radio has shown the potential for agricultural extension to benefit from both the reach and the relevance that local broadcasting can achieve by using participatory communication approaches. The importance of sharing information locally and opening up wider information networks for farmers is explored with reference to the specific example of vernacular radio programmes based on research on soil water conservation. This paper described this particular experience in the context of rural radio as a tool for agricultural extension and rural development, with reference to the radically changing technology
environment that is now influencing information and communication process worldwide. The implications for policy-makers for harnessing rural radio to improve agriculture are also discussed.

However, the demerits are seen in Pronatura-Chiapas (2004) who assessed the level at which community radio stations in Africa are involved in programming of content on sustainable development themes / topics. The report found that community radio stations are not doing enough to ensure that local communities take part in the selection and production of programmes regarding sustainable development issues, especially in deciding what themes or topics to cover. The focus group discussions highlighted the potentially significant role that community media can play in facilitating community and national ownership of development agendas, particularly when programming is conducted in local languages.

Moreover, the public engagement model has political overtones. The main agenda seems to be top-down and focuses on the science policy of the Government.

Since the public engagement model is meant to shape Government’s science policy, a variation of this model may help focus on other grassroots issues. Such a variation is what may be called the participatory model of development communication proposed by Paulo Freire. This stresses the importance of cultural identity of local communities and of democratization and participation at all levels – international, national, local and individual. It points to a strategy, not merely inclusive of, but largely emanating from, the traditional ‘receivers’ (Freire 1983).
Figure 3.1 shows the main focus of these models for public understanding of science and technology:

**Main Focus: Information Delivery**

- **Contextual Model**
  - Tied to particular audience(s)
  - Pays attention to needs and situations that may be time, location, disease, language…
  - Highlights ability of audiences to quickly become knowledgeable about relevant topics

- **Deficit Model**
  - Linear transmission of information from experts to the public
  - Belief that good transmission of information leads to reduced ‘deficit’ in knowledge
  - Belief that reduced deficit leads to better decisions and often better support for science

**Main Focus: Engaging the public**

- **Lay Knowledge Model**
  - Acknowledges limitation of scientific information
  - Acknowledges potential knowledge of particular audiences
  - Highlights interactive nature of scientific process
  - Accepts expertise away from scientific community

- **Public Engagement Model**
  - Focuses on policy issues involving scientific and technical knowledge
  - Tied to democratic ideal of participation in policy process
  - Builds mechanisms for engaging citizens in active policy-making
  - Real public authority over policy and resources

**Figure 3.1 Conceptual Models of Public Communication of Science and Technology**

*Source: Lewenstein and Brossard (2006)*
3.2.1.5 Participatory communication approach

White (1994) pointed out that there can be no sustainable development unless people become the agents of their own development, not just be beneficiaries, they should participate fully at every stage of the development process. Participation in social change activities is a key for social development. Participatory communication approaches require a number of skills, including fluency in local dialects, knowledge of local conditions, belief, culture and customs, ability to translate technical jargon into locally understandable concepts, as well as group dynamics and group facilitation skills. Listening to people is one of the first steps and an essential prerequisite for participatory communication. Listening goes beyond learning about their perceived needs. It involves listening to what people already know, what they aspire to become, what they perceive as possible and desirable, and what they feel they can sustain.

Mefalopulos (2003) defined participatory communication as an approach capable of facilitating people’s involvement in decision-making about issues impacting their lives – a process capable of addressing specific needs and priorities relevant to people and at the same time assisting in their empowerment. Freire’s model and participatory models in general proposed a human-centred approach that valued the importance of interpersonal channels of communication in decision-making processes at the community level (Siddiqui 2003).

The main essence of participatory development theory is an active involvement of people in making decisions about implementation of processes, programmes and projects, which affect them (Slocum et al 1995). Participatory development approaches view the term ‘participation’ as the exercise of people’s power in thinking, acting, and controlling their action in a collaborative framework (Dinbabo 2003).
In this context Chinese philosopher Tse argues that the principle of the participatory approach includes (Dennis 1997; and cited in Dinbabo 2003):

*Inclusion* – of all people, or representatives of all groups who will be affected by the results of a decision or a process - for example, a development project

*Equal partnership* – recognizing that every person has skill, ability and initiative and has an equal right to participate in the process, regardless of their status

*Transparency* – all participants must help to create a climate conducive to open communication and building dialogue

*Sharing power* – authority and power must be balanced evenly between all stakeholders to avoid the domination of one party

*Sharing responsibility* – similarly, all stakeholders have equal responsibility for decisions that are made, and each should have clear responsibilities within each process

*Empowerment* – participants with special skills should be encouraged to take responsibility for tasks within their specialty, but should also encourage others to also be involved to promote mutual learning and empowerment

*Cooperation* – is very important; sharing everybody’s strength reduces everybody’s weaknesses.
Here are some characteristics of the participatory communication model:

- People are the controlling actors or participants for development
- Local culture is respected
- Multi-directional flow of information
- Sharing of views among the people
- Redistribution of the elites’ power so that a community can become a real democratic
- Participants: scientists, science communicators, content producers and the community.

Freire’s notion of dialogic communication as a normative theory of participatory communication is accepted widely. However, his theory is based on group dialogue rather than on amplifying media such as television, newspaper or radio. Participatory radio means a radio station that is self-managed by those participating in it. Rogers et al (1977) examined the effectiveness of a radio forum in helping individual learners gain knowledge. This work was a development of the effectiveness studies done on the Poona project by Neurath (1969) and Schramm et al (1967, 1976). The study established that radio forums involving peasants in participatory learning and action led to improvements in the quality of their lives. The radio is urban based. The radio finds it easy to talk to the urban audiences. It is often seen in developing countries that the media carries news and concerns of the urban classes for they form a majority of its audience.
3.2.1.6 Participatory communication approach in radio

Rogers et al (1977) defined a radio forum as a “small listening and discussion group that meets regularly to receive a special radio programme, which the members then discuss.” They further contend that ‘on the basis of the programme and discussion’, community members of a radio forum then decide on what relevant action to take. In this model, the objectives of the radio forum include “encouraging people to solve their local community problems, breaking down rural isolation and developing community leadership,” and not merely disseminating rural development information.

Here is an example that shows some of the merits of the participatory model. McKay (2003) made an exploratory analysis of the role that radio plays in fishers’ livelihoods and lives in Anyakpor, a fishing village in southeast Ghana. The study’s findings reveal that fishers rely on radio alongside other media for livelihood information. Radio is also enabling fishers to learn about their livelihoods from each other, providing them with useful information for their work; promoting culture, identity, and community; providing access to news; creating opportunities for voice/dialogue; and establishing a level of trust. Fishers indicated that in the future they would like to further integrate radio into their community.

Singh and Jamwal (2009) said that grassroots communication cannot be compartmentalized into ‘local’ level approaches and their universal application outrightly rejected. Global and local have amalgamated to form ‘glocal’ which is mostly based on audience interest, choice and perspectives. Thus, the concepts of diversity and pluralism operate at the level of the receiver.
UNESCO has defined participatory communication in terms of three parameters:

1. **Access**: Use of media for public service may be defined in terms of the opportunities available to the public to choose various and relevant programmes and to have a means of feedback.

2. **Participation** implies a higher level of public involvement in communication systems. It includes involvement of the public in the production process and also in the management and planning of communication systems.

3. **Self-management** is the most advanced form of participation. Public here exercises the power of decision making within the communication enterprises and is fully involved in the formulation of communication policies and plans.

These ideas are widely accepted as normative theories of alternative communication. Participatory radio is a good example of this. Participatory radio means a radio station that is self-managed by those participating in it.

The ‘democratic participant’ theory is, for instance, based on Freire’s proposed pedagogy of the oppressed in which the teacher (or media producer), is no longer the authority, but a learner-cum-teacher. That is, someone who both learns and teaches in dialogue with fellow learners-teachers in a context of community involvement (Mody 1991; and cited in Kanyegirire 2002). Freire’s approach encouraged peasant participation in the radio schools, thereby replacing the hierarchical system of local administrators with a mechanism through which they would act as facilitators of ‘campesino’ radio school programmes rather than as mediators.
of cultural messages from distant political or educational centres (Lewis and Booth 1990; and cited in Kanyegirire 2002).

This switching of the roles between the media producer and the recipient of media content in radio has led Downing (2001) to insist that local radio offers radical alternatives to mainstream media, particularly at the grassroots in nations with substantial illiteracy, including major nations such as India and Brazil. The establishment of local radio has repeatedly contributed to movements of social change in the Algerian revolutions, in the struggle against Apartheid in South Africa and in Italy. According to Downing (2001), such projects are more pronounced in situations where the state jealously guarded its monopolistic control over broadcasting.

Though these models are frameworks for understanding what ‘the problem’ is, how to measure the problem, and how to address the problem, because of their drawbacks there is a need to develop a new model which incorporates the strengths of these models and do away with their weaknesses. The next section explores this possibility in detail.

3.3 CONCEPTUAL ILLUSTRATION OF THE MODEL AND THE RELEVANCE TO THE PRESENT STUDY

Different models of science communication and participatory communication approach attempt to specify various features that make science communication truly efficient. All these models considered together present a general view of what constitute communication; but each of them highlights only one science communication model to the exclusion of the others. A broadcaster, however, needs a comprehensive description of what constitutes science communication.
For the purpose of this study, it could be relevant to arrive at a notion of science communication that includes all these perspectives without unduly exaggerating any one of them.

Though there had been a number of models developed to explain the workings of science communication, it has been seen that the strengths of each are countered by inherent weaknesses. This is mainly due to the fact that there are underlying assumptions. Merton (2008) discussed the various models of science communication, with an emphasis on the inadequacies of the so-called deficit model, and proposed a science communication environment, within which a multiplicity of models may be appropriate to explain a wide variety of science communication phenomena. She also said: “The exploration of alternative science communication models led me to reject them as insufficient to account for science communication as a whole, but to accept them as sufficient to account for aspects of the science communication environment.” However, her approach may be seen as communicating bio-technology using the contextual model.

Lewenstein and Brossard (2006) pointed out that the theoretical models discussed in the scholarly literature seem to be far too static and tend to be presented as incommensurable, when in reality they should be taken into account simultaneously. The literature reviewed in Chapter 2 and the examples in section 3.2 bear ample evidence for this.

Consider then Davies’ descriptive account of science communication (2008). What she calls the ‘packet’ model is a model of communication in which scientists consider their communication to consist in the transfer of pre-developed ‘packets’ of information to the public. This is an example of a monologic asymmetric communication model: the direction of communication is mostly one-way, and the intended effect is only on the public (increased information, knowledge, or understanding). Such a model is
an asymmetric monologue even if information were collected about the audience to determine which ‘packets’ are appropriate based on their background knowledge or interests; in such a case, there is no real dialogue, as the transfer of information to the speaker may be only one-time and is meant only to improve the one-way flow. Differences between a ‘packets’ model and other equally asymmetric monologic models might be found in the degree to which scientists alter what they say for different audiences and what the intended goals are. There can be significant variation in how ‘pre-canned’ and ‘one-size-fits-all’ the content of the communication is to be, all within a context of delivering different, mostly asymmetric monologues, with directed information flow and intended effects (Tanona et al 2011).

Audience values and other characteristics may play a role in science communication not merely via the contextualist model, according to which members of the public may perfectly well understand a theory, even in significant detail, but choose to reject it because they believe it conflicts with some of their pre-existing views. They may also play a role in the public’s ability to gain and develop knowledge, so that even if it is a deficit of knowledge of a scientific theory that causes a negative attitude towards it, having values that seem to conflict with the theory tends to lead people not to lend appropriate credence to the evidence provided for it by a proponent of the theory (Lord et al 1979).

A less conservative method would be to change one’s message in more substantive ways to prevent an audience’s values from interfering with their understanding of the message. It has been shown that when an audience will view some information or the presentation of such as potentially challenging to some aspect of their self-identity, the attitude polarization that would result can be reduced by providing a path of self-affirmation via some alternative mode of self-identity (Cohen et al 2000;
Affirming audience identity in ways unassociated with the scientific topic may therefore allow the audience to examine evidence and arguments with less bias. There are also strategies shown to be effective in prompting audiences to examine potential cognitive dissonance in non-defensive ways, for example by merely inviting them to consider the ‘opposite’ viewpoint (Lord et al 1984).

Tanona et al (2011) said, “We believe not only that more work needs to be done to understand scientists’ talk about the public in a generalized context, but also that more needs to be done to uncover the norms and values scientists hold about their communication with the public.”

They concluded by saying, “analysis of the norms that scientists hold regarding their communication with the public indicates that there are several core values many of them hold, including objectivity, accuracy, and lack of bias. It is plausible that these norms influence scientists’ choice of communication strategies. Thus, any argument that scientists ought to adopt different models of communication or employ different strategies will need to show that these changes are consistent with these core values. By making the argument in this way, communication specialists will be more able to persuade scientists to alter their communication practices.”

Hence, there is a need for a participatory approach, the variables participation and media have been given more emphasis in science communication; mainly because Paulo Freire’s emphasis on participation and local media for development communication has a key role to play in science communication and the mainstream media too.

Subsumed here are the major communication models: deficit, contextual, lay knowledge and public engagement. This participatory approach will be comprehensive, holistic and will have no hidden agenda.
Here follows a brief description of relationships of the elements in the participatory model:

Science is a necessary condition for the growth of society but it cannot be an autonomous institution far removed from daily life. Therefore, it is connected with democratic participation of the people. Science communication is a mosaic that seamlessly connects with all members of society, namely policy makers, scientists, academics, communicators, journalists and laypersons.
Participation in science communication consists of three variables: 1) experts 2) users and 3) laypersons. This is because communication of science by experts is an important part of teaching science, and so are the involvement of the users and laypersons. When they fail to interact, science communication breaks down. Their relationships may be seen as a dyad:

- E2E [Expert → Expert]. The conferences of the Indian Science Congress Association and other international and national science conferences are basically interactions between scientists or science broadcasters or academics, considered to be experts in their chosen scientific disciplines.

- E2U [Expert → User]. Science workshops invite experts as resource persons to help the users follow instructions in the use of the latest technology.

- E2L [Expert → Layperson]. Science news and science programmes in the mass media help the laypersons to be aware of the latest findings in various fields such as health, agriculture, bio-technology and climate change.

The deficit model may be used where there is a real lack of knowledge about science; the contextual model, in case there is a conflict of interest; the lay expertise model, mostly in educated communities; and the public engagement model, when the Government’s science policy has to be shaped for the larger interests of society. Thus this participatory model is a convergence of other science communication models with added emphasis on the role of participation of the people and the media.

Though it is possible to choose one of the existing models for this research on science communication through radio in Chennai, the model
proposed here would empower radio broadcasters to understand the importance of the variables namely reach, utility and level of application for the effectiveness of the broadcasts.

The lacuna found from the existing models propelled the researcher to develop the participatory model to grasp effectiveness of the scientific knowledge of the individuals for the day-to-day problems like health and climate. Thus, with this holistic representation the model would provide more precise prospective of effectiveness of science communication in the study area.

The present framework eventually makes the process of public communication of science – and thereby the activities in which science communication practitioners are routinely engaged – more relevant, not only as a means to achieve certain objectives, but also as a central space in which to understand (and participate in) the interacting transformations of both science and public discourse. In this perspective, communication is not simply a technical tool functioning within a certain ideology of science and its role in economic development and social progress, but has to be recognized as one of the key dynamics at the core of those co-evolutionary processes (Nowotny et al 2001; Jasanoff 2004, 2005), redefining the meanings of science and the public, knowledge and citizenship, expertise and democracy.