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# SCIENCE COMMUNICATION AS A TOOL FOR DEVELOPMENT

**Kapil Kumar Bhattacharyya**
Guest Lecturer,
Hiralal Mazumdar Memorial College for Women,
Kolkata-700035, West Bengal, India
Email: kapilkrbhattacharyya@gmail.com

*Abstract*

*While science has always striven to seek the betterment of mankind, its efforts towards the same have come out in the public domain in a very selective and sporadic manner so much that the common man remains sceptic about the marvels of science despite using them in his daily life. Science communication refers to the communication efforts towards bridging this gap between science and the common man. This paper shall endeavour towards highlighting the role and importance of science communication in achieving the goals with respect to human development. It shall also try to throw some light on the impediments in the path of effective development of communication efforts in India and possible alternative approaches in that direction.*

***Keywords:*** *Science Communication, Development, Machine-mania, Researchers, Policy makers, Digital divide, Grass-root level, Scientific temper, Quality information service, Audience participation, Feedback, Kudankulam Nuclear Power Plant, Dog's Tail Syndrome, Communicators, Policy–makers, Opinion leaders, Media, Quadruple Model of Development Communication, Environment-specific Approach*

> "One atom in the universe cannot move without dragging the whole world along with it."
>
> -Swami Vivekananda

The word 'development' has perhaps been one of the most misinterpreted terms to have been used in the greater half of the last century and the situation remains the same till date. While the concept of development has undergone considerable change over the years, the present concept of development is still far removed from reality. By a common consensus, human development, as we have it today, is often equated with parameters that are perhaps more suited to the measurement of various variables that accompany development but do not signify the same in totality, such as, financial growth, economic progress, infrastructure building and so on and so forth. However, there is a lot more to development than that meets the eye. Human development is not just about economic growth, for money alone cannot ensure human happiness. Development is more about a positive change in a person's living conditions, a change that is desired by him and striven for towards achieving the same at a future point of time primarily owing to its unavailability at a certain point of time.

However, development is not about change as in mere infrastructure or resource building. A classic example of this is the 'machine-mania' that is gripping the world thick and fast. Nowadays, considerable emphasis is being laid upon the utilisation of various gadgets in the daily lives of human beings. From computers to mobile phones, the whole world seems to be running after them. It would appear as if the modern inventions of science are agents of development. However, this is not entirely true. While it is true that the modern inventions of science are throwing open a wider range of opportunities before human beings, they cannot be said to be contributing to the overall development of the latter.

Let us assume, for instance, that a scientific organisation wants to improve the living condition of farmers in a specific village. Now, it is a capital mistake to assume that providing the farmers with any scientific innovation such as computer set-ups or mobile phones would help them in attaining development unless they are able to operate or maintain the gadgets themselves. This is true even for a scientific innovation like tractor which is directly beneficial to the cause of a farmer. A farmer who cannot operate a tractor or does not

have the money to buy diesel is unlikely to be benefitted from the tractor. Thus, in order to achieve development, we need to ensure that a scientific innovation is accompanied by efforts towards empowering the concerned person as well so as to provide him the platform of availing himself of that scientific innovation.

However, there is another facet to development as well. While it is true that development seeks to improve the present state of living of human beings, it ought to be remembered that human beings exist because the earth exists. Thus, while efforts towards human development need to be taken, the future of the earth also needs to be taken into account. This aspect of development is attributed as sustainable development. According to the Brundtland Report released by the United Nations in 1987, *"Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs."* Such an approach is of paramount importance since the resources on the earth are limited while human population is increasing at a rapid pace. Unfortunately, when the policy-makers take decisions on development issues, they either do not care taking into account the scientists for consultation or simply fail to bring scientists to the discussion table. This is rather unfortunate because scientists understand the dynamics of the planet like none other. They alone can predict the future of the earth based on empirical evidence and logical assumptions. Thus, scientists need to play an active role in policy-making decisions.

Communication is as old as mankind and shall exist as long as mankind exists. Human development is a logical corollary to positive transformation and the means to achieving the same remains communication. This communication for development is ascribed as development communication. Thus, any communication effort that strives towards ensuring a development process essentially falls under the domain of development communication. As Nora C. Quebral defines, development communication is *"...the art and science of human communication linked to a society's planned transformation from a state of poverty to one dynamic socio-economic growth that makes for greater equality and the larger unfolding of individual potentials."* Interestingly, Nora C. Quebral does not use the word 'development' while defining 'development communication'. Instead, she prefers using the phrase 'planned transformation'.

The real essence of 'development' lies in transformation. Transformation is a constant process with no possible end. As long as humanity exists, transformation shall keep on taking place. Positive transformation remains the heart and soul of development. For this though,

proper planning and subsequent implementation ought to be done. Herein lies the role of communication. Thus, communication that focuses on a planned transformation of the society from a state of relative inferiority to state of superiority, thereby, ensuring in the process, the desired living conditions for individuals and mankind as a whole, can be termed as development communication.

While a lot has been said about the contribution of science to the development of mankind, the facts remain to say that, though science has indeed made progress by leaps and bounds as far as technological achievements are concerned, the same cannot be said about human development per se. Of course, science has made human lives more comfortable than ever before with some amazing technological marvels. But then, truly speaking, science has also promoted what I would like to call the 'theory of relative comfort'. Such has been the effect of the marvels of science on human beings that they tend to see only those aspects of science that are comforting to them. This is primarily because science communicators are keen on showing only the brighter aspects of science and rarely tell people about its possible adverse effects. Such an approach is bound to breed an air of suspicion, mistrust, confusion and hostility towards science in case of any untoward eventuality.

Besides, this approach of science communicators has always been essentially limited to certain individuals and unidirectional, that is, from the innovators to the laggards. But then, at times, human beings become laggards out of compulsion and not due to any habit per se. In a way, science may have actually contributed to this situation by allowing a state of digital divide in place where a certain section of the society has access to most scientific innovations while another section has access to virtually nothing. No wonder, the latter section is bound to lag behind. As a matter of fact, the question of making a choice simply does not arise since they do not have any choice at all. As Dr. A.P.J. Abdul Kalam[i] opines, *"Science is very pure in its aims, and science does not know any borders, of either geography, political, linguistic or religious. But, science, has one disadvantage as well – in division of people between those who know science and those who do not; those who use it and those who do not. The divide, manifests itself in many names, such as, developed and developing nations; economically advanced and economically backwards; and the latest phrase used is; digital divide. This divide caused by imbalances in scientific knowledge has been one of the key factors leading to disharmony across the world including religious or political conflicts, terrorism and civil disobedience."*

Interestingly enough, science communication can play a very important role in bridging this digital divide. As Dr. A.P.J. Abdul Kalam further adds, *"Fortunately, science also has the potential to remove these imbalances and bring happy and prosperous order in the nations and societies across the world. One of the recent contributions has been in the field of communication. Communication has advanced so much that we could transfer knowledge from the experts to the least empowered citizen without the concern of distance and time taken. So time is most apt today for the usage of giga-bandwidth and eloquent capabilities of scientist to explain complex concepts with absolute ease to the common man."*

An argument frequently put forth by scientists while making predictions is the possibility of the predictions being inaccurate. But then, the future itself is uncertain. As Niels Bohr once said, *"Prediction is very difficult, especially about the future"*. Thus, while unpredictability may be the greatest curse of science, it is the greatest boon as well because it constantly urges scientists to seek beyond the present. Therefore, uncertainty ought not to be an excuse for scientists in being hesitant towards making predictions. If astrologers can predict the future of human beings by merely analyzing their palms, science communicators surely can predict the future of earth and its inhabitants on the basis of logical deduction. While it is debatable indeed whether science can predict the future with utmost precision, it might as well be feasible to sound an alert in an upcoming disaster situation than trying to assure the masses that all is right and there's nothing to be worried. Besides, such openness and transparency is also likely to act as a cohesive bond amongst all the stakeholders, the researchers, the policy makers and the citizens alike to actively work towards the betterment of a nation and its individuals. Thus, planned and effective communication among the scientists, the administrators, the opinion leaders and the masses is the utmost need of the hour.

**Science Communication as a Tool for Development Communication**

For an effective development communication endeavour, effective communication and mutual understanding between the concerned parties is of paramount importance. While science is vital to the development of human beings, the role of communication in bridging the gap between science and the ordinary people cannot be undermined. Unfortunately, there is a considerable distance between science and the masses. Most ordinary people look upon science with either awe or fear. This will only widen the chasm. Under such circumstances, effective science communication can go a long way in bringing people closer to science.

Events like science seminars, science congresses and science exhibitions should be given wider publicity right from the grass-root level preferably accompanied by open access to the masses. People ought to be encouraged to attend such events in every possible manner even if it might mean providing them free access to such events or science museums. A token relaxation initially can go a long way in winning people's hearts. Once people become familiar with science and fall in love with the charm of science, policy-implementations will become a lot easier. Initiatives like mobile science exhibitions on trains can also go a long way in providing access to science to the people in rural areas.

In the words of Dr. A.P.J. Abdul Kalam, *"The role of science communication is no longer limited by communication bandwidth but the imagination bandwidth of scientists. I have three important tasks for the experts engaged in science communication:*

1) *To make all citizens, particularly those in remote and rural areas (e.g. India has 700 million rural population) to feel excitement about science.*
2) *To make all the citizens to know about the advances of science and their role in the society in economic and health development and to bring more and more of fruits of science within the reach of their daily lives while being sensitive to the sustainability of our planet and our responsibility towards it.*
3) *To motivate the students and entice them to embrace science as a profession. There are many young inventors and imaginative citizens (including from remote rural areas), sometimes without a formal training, who can be brought to public attention and encouraged."*

Thus, science communication can be an effective tool for promoting development communication in a developing country like India. However, for that to materialise, science communication needs a definite blueprint. It cannot go about seeking the objectives in an arbitrary and abstract manner. In my opinion, the following points may be borne in mind by science communicators to ensure effective science communication.

1. **Inform the masses factually:** This is the primary function of all forms of communication. Science communicators should also inform the masses in a factual manner. Hiding facts does not mean that the facts will change over a period of time. It is always advisable to inform the masses about an unpleasant truth and try to convince them

to take the risk than to tell them that there is no risk at all. After all, the service of mankind is the primary objective of science.

2. **Inculcate scientific temper:** People cannot be forced into accepting the apparently surreal marvels of science if they remain stubborn towards preconceived notions. Hence, science communicators should strive to inculcate scientific temper in the first place amongst the masses by making them realise that science actually seeks their betterment.
3. **Spread awareness among the masses:** Communication can be effectively employed for spreading awareness among the masses. Science communicators should create awareness about scientific activities occurring in the public domain and their benefits as well as possible repercussions.
4. **Integrate and mobilize the masses:** Science communicators should work towards integrating the masses by building a consensus among them. Once consensus is achieved, it will be easier to mobilize the masses into embracing newer ideas and that too, probably, in a more enthusiastic and effective manner.
5. **Create public opinion among opinion leaders:** Communication plays a vital role in creating public opinion by analyzing and discussing the contemporary scenario on issues of interest to the people. However, science communicators ought to stop short of imposing their interpretations upon people. As Carl Magee said, *"Give light and the people will find their own way."*
6. **Provide quality information service:** Science communicators have the responsibility of providing quality information service to the masses, a service that can provide the right information from the right person to the right person through the right channel at the right time to secure the people's participation. Such a service shall also definitely act as a cohesive bond within the masses.
7. **Seek mutual participation:** Science communicators must try to ensure a dialogic communication between the citizens and the policy-makers because such a communication seeks to empower people by encouraging them to express their opinion unlike monologic communication that merely informs people and tries to persuade them into merely carrying out the orders of the administration. Thus, science communicators must seek active participation rather than passive participation.
8. **Ensure feedback:** Any communication process remains incomplete without feedback. Hence, science communicators should ensure feedback from the masses. It is a capital mistake to assume that no feedback is equivalent to negative feedback. In fact, no

feedback is worse than negative feedback; No feedback - no assessment - no improvement - no development.

9. **Persuade the masses:** According to David Berlo, persuasion is the primary motive behind communication. Keeping in line with the persuasive function of communication, science communicators should seek to mould people's behaviour in a desirable direction that is likely to benefit the society, thereby, trying to formulate a consensus.
10. **Respect the sentiments of people:** Science, at the end of the day, is meant to serve people. This service cannot be provided by rigidity. Thus, science communicators must respect the sentiments of the people even while trying to persuade them into a fresh innovative idea.
11. **Respect the Cs of communication:** Above all, science communicators must respect the Cs of communication to ensure a fruitful communication experience. These include:
    (i) **Credibility:** Science communicators must verify that the information is credible.
    (ii) **Context:** Science communicators should never emphasize on information out of the context.
    (iii) **Content:** Science communicators must always stick to the relevant content.
    (iv) **Clarity:** Science communicators must put out the messages distinctly and in the simplest possible manner.
    (v) **Continuity and Consistency:** Science communicators must ensure continuity and consistency in the message.
    (vi) **Channels:** Science communicators must stick to audience-specific channels.
    (vii) **Capability of the audience:** Science communicators must always bear in mind the capability or adaptability of the audience.

**Science Communication as a Tool for Development Communication in India**

With great power comes great responsibility. India is the second most populous country in the world. Beyond the usual problems that accompany an over-populous nation such as uneven distribution of technological innovations owing to economic disparities and lack of adequate food supplies due to insufficient food production to meet the demand, India today faces serious threats in the environmental front as well. While global warming is a matter of concern across the globe, its impact has been excessively felt in the Indian context with visible effects such as inconsistent seasonal patterns over the years and a sharp increase in the temperatures. One of the primary reasons behind this is the mindless deforestation drive that

has taken place across all parts of the nation despite efforts towards convincing people to neither practise nor allow such actions.

While it is true that a tremendous increase in the population and lack of open space has been primarily responsible for such rampant deforestation, it cannot be overlooked that science communication has been a failure to a large extent as far as convincing people against deforestation is concerned. In fact, this holds true for many awareness initiatives in the environment front, such as, non-usage of plastic bags, keeping water bodies clean, non-wastage of paper and so on and so forth. I believe one of the reasons why people do not take such initiatives seriously is because they actually do not realise the danger they are putting themselves into by their reckless approach. That to me reflects the failure of science communication in convincing people of the impending dangers lying ahead. The key lies in taking the people into confidence through a regular process of interactions. As the House of Lords Select Committee on Science and Society recommended in a report published in February 2000, *"That direct dialogue with the public should move from being an optional add-on to science-based policy-making and to the activities of research organisations and learned institutions, and should become a normal and integral part of the process."*

Thus, science communicators must not provide mere lip-service. They must not overlook or underplay facts. It is the duty of a science communicator to communicate the true picture to the masses. Not too long ago, six Italian scientists and an ex-government official were sentenced to six years imprisonment in connection with the earthquake in Italy on April 6, 2009 that took away 300 lives. According to an Italian media report, all of them - all members of the National Commission for the Forecast and Prevention of Major Risks - were accused of having provided 'inaccurate, incomplete and contradictory' information regarding the possible risk of the tremors preceding the massive earthquake.

Besides, it is amazing to see how the failure of proper science communication efforts can even topple governments. While development initiatives through science can considerable boost a nation's economy, the inability of science communicators in convincing the people about its benefits can have catastrophic effects on the political scenario. Perhaps this risk of political rejection has been one of the major reasons why policy-makers, particularly, in developing countries like India have generally been shy of taking bold but unpopular development initiatives through scientific endeavours.

**The Kudankulam Experience**

> *"I don't have any particular comment on opposition to nuclear power anywhere, or those who support it, but if I can give a recommendation, we need to share both good news and bad news to be able to get a better understanding of the problem."*
>
> -IAEA chief Yukiya Amano

The Kudankulam Nuclear Power Plant is a nuclear power station under construction in Kudankulam in Tamil Nadu. Apparently, the construction has been delayed owing to anti-nuclear protests by various groups. In fact, a few other nuclear power plant projects have also faced stiff resistance across the nation recently. These include the Jaitapur nuclear power plant project in Maharashtra and the Haripur nuclear power plant project in West Bengal. The issues raised by the protestors at Kudankulam include primarily safety and environment concerns despite the fact that former Indian President Dr. A P J Abdul Kalam who happens to be an eminent scientist himself has quashed all safety concerns regarding the Kudankulam Nuclear Plant.

While I am no expert on nuclear technology or science in general, I do believe that when a person of Dr. A P J Abdul Kalam's stature makes a statement, it does warrant importance. Besides, when 20 operational nuclear reactors in different parts of India are seemingly working fine, I personally do not find any reason to be alarmed. However, the protestors at Kudankulam think differently. The question remains why? The answer, I feel has got more to do with communication skills than any science related concerns. Apparently, the sudden and widespread protests at Kudankulam can be attributed to the following factors:

a) The absolute secrecy maintained by the government and the nuclear authorities prior to the enactment of the Civil Liability for Nuclear Damage Act, 2010.
b) The nuclear accident at Fukushima in 2011;
c) The failure of the government to assure the opinion leaders who were leading the protestors following nuclear accident at Fukushima with regards to emergency measures, safety precautions in case of such disasters.

While it is debatable indeed as to how effective the alternative approaches would have been, it would have certainly a world of good to the administrators to have maintained an open and

transparent relationship with the people of Kudankulam ever since the foundation stone of the nuclear power plant was laid. Besides, increased public awareness campaign following the nuclear accident at Fukushima might also have been considered instead of expecting people to move beyond the Fukushima disaster on their own. As the chief of International Atomic Energy Agency (IAEA) Mr. Yukiya Amano told a leading newspaper, *"Communication is one of the areas where we need to improve and IAEA has been organizing meetings of international experts to look into this. We have to explain complicated things in a simple manner and it is only through better communication and higher transparency that we can achieve this."*

From a public relations personnel's point of view, this might be an apt example of crisis management. If we consider that the nuclear accident at Fukushima in 2011 was the point of crisis that ultimately led to the current state of affairs in Kudankulam, it may well be said that the absolute secrecy maintained by the government and the nuclear authorities prior to the enactment of the Civil Liability for Nuclear Damage Act, 2010 was a glaring example of poor pre-crisis management while the failure of the government in being able to assure the opinion leaders who were leading the protestors following nuclear accident at Fukushima with regards to emergency measures, safety precautions in case of such disasters has been one of very poor post-crisis management display.

Thus, there can be no denying the fact that the Kudankulam nuclear power plant project suffered partly owing to the initial lack of foresight in disaster-anticipation of the administration and partly owing to the lack of post disaster-management. Interestingly, both the factors have one factor in common, that of, lack of effective communication skills, initially for crisis prevention and later for damage control. Since the issue in contention here is primarily science oriented, it will not be out of place to assume that there was a significant lack of science communication in both the cases. While science communication might not be a public relations tool essentially in the first place, I would like to believe that it might just have made things easier in case of Kudankulam.

Thus, while it actually might be highly unlikely that a Fukushima-like disaster shall ever happen at Kudankulam or the other proposed nuclear power plants, there can be no denying the fact that it is the people who need to be convinced of the same as they are the most important 'publics' in any such endeavour. Thus, people ought to be assured and convinced of the preventive measures taken in order to avoid any Fukushima-like situation and also of

the safety measures in case of any eventuality. While one might argue that such an approach entails great risk as people might have to be told about some possible uncomfortable crisis situations, it is always advisable to inform them about an unpleasant truth and try to convince them to take the risk in the larger interest of the nation than to hide the risk from them.

The second reason I feel is the lack of scientific temper amongst the protestors. Scientific temper refers to the inculcation of liking and respect for science which culminates in the application of human reasoning and a subsequent shift from personal preconceived notions backed by emotions devoid of logic. As Rajiv Gandhi, the former Prime Minister of India once said, *"Once we have a scientific temper, basically it will remove the fear of the unknown which keeps people back, which keeps people moving ahead and using the tools that are available to them. The scientific temper will help to develop inquisitive spirit. It is only when we start thinking that a scientific temper will develop and we ourselves will start improving the tools we have got and we live with."*

Both the reasons essentially point towards a communication failure on the part of the concerned authorities. In this case, we may safely say that the Kudankulam experience has been a resultant of ineffective science communication to a large extent. Since independence, Indian authorities have been pretty much sceptical about sharing information with the masses especially, when it concerns technological matters. While is understandable that every nation has certain security concerns, the facts remain to say that a bit of information sharing can actually help in stemming the curiosity of the people. Thus, proper dissemination of information concerning scientific innovations and the inculcation of scientific temper amongst the masses is the pressing need of the hour. Such an approach can go a long way in significantly increasing the level of public understanding with regards to science.

**Conclusion**

Science communication has had a chequered history in the Indian context. We are a nation that gave the world of science some of the best scientific stalwarts of the ancient world such as Aryabhatta, Kanad, Varahamihira, Nagarjuna, Susruta, Charak and so on. Nearer in time also, India has given the world some of the finest scientific minds such C.V. Raman, Homi Jehangir Bhabha, Jagdish Chandra Bose, Meghnad Saha, Satyendra Nath Bose, Vikram Sarabhai, Srinivasa Ramanujan, Dr A.P.J. Abdul Kalam. They are but to name only a few. Unfortunately, a lot of Indian scientists did not get their due recognition partly due to

Western imperialism and partly due to lack of proper documentation and adequate discussion of their works in the public domain. That to me is, indeed, again an unfortunate example of abject failure of science communication.

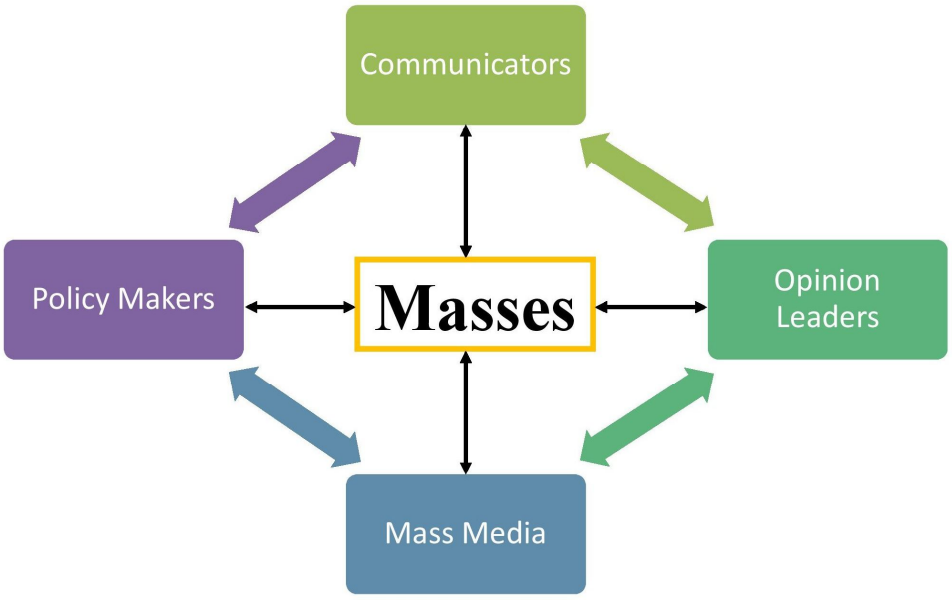
However, let bygones be bygones. Though we cannot rewrite the past, we can surely strive towards a better future. India still has a fairly long distance to go in order to fulfil the cherished desire of becoming a developed country and science communication remains indispensible to its efforts towards the same. Science communication has the crucial role of not only initiating development efforts by motivating people to embrace science but also of ensuring that earlier development efforts are not laid to waste. Thus, one of the significant objectives of science communication ought to be preventing the Dog's Tail Syndrome. Dog's Tail Syndrome is the term coined by Dr. Biplab Loha Choudhury to *"express the qualitative state of Indian peoples' development vis-a-vis development efforts of the country"*. According to Dr. Biplab Loha Choudhury, Dog's Tail Syndrome is *"a condition in which so much may be the effort, once the force (here the money and the key-implementers from outside the community) is withdrawn, entire effect almost vanishes"*.

In this regard, science communicators must bear certain points in mind. At the very outset, they must interact with the masses regularly and try to inculcate scientific temper in their minds in the first place. Such an approach will also help in them in overcoming the phatic stage of communication. Secondly, it is always advisable to tell people about the potential future problems first and then talk about the solutions. Unless people are convinced about the problem, they are unlikely to waste time over possible solutions. Besides, people should also be told of the possible repercussions and be persuaded to take the risks in the best interests of their future instead of keeping them in the dark and persuading through lies. Science communicators must also seek feedback from all the stake-holders and stay open to mutual consensus. In today's world, almost all development communication efforts hinge upon four development agents:

1. The communicators, generally the experts in the concerned field;
2. The policy –makers who make decisions in the best interest of the state;
3. The opinion leaders who play a vital role in formulating public opinion;
4. The press/ media that keeps an eye on everybody and keeps the masses informed.

In this regard, I would like to propose a new model for effective development communication which I believe shall prove effective in realising the long-standing goals of development communicators across the globe that have remained unattained till date, especially in the developing countries.

**The Quadruple Model of Development Communication**




This model may be called the Quadruple Model of Development Communication as it acknowledges the importance of all the four development agents indispensable to the cause of attaining the goals of a country through development communication. This model also recognises the importance of interaction and consultation both within the development agents and between the development agents and the masses. This model, in my opinion, shall be equally efficient in context of the efforts of science communicators towards development in today's scenario.

To conclude, I would like to wrap up this discussion and strive towards striking a line of reconciliation between the two human needs of science and communication by suggesting a mutual accord of understanding, co-ordination and respect for each other in the times to come. As Dr. A. P. J. Abdul Kalam believes:

> *"Economic growth, urbanization and exposure to foreign value systems can also bring in various conflicts and alienation. These are aspects which need to be attended to on the social and cultural planes. Perhaps India may have*

*to devise suitable organizational and educational systems and the media to address social and cultural aspects of life. No doubt our ancient wisdom and traditional knowledge would prove invaluable in this effort. Newer information technologies can help in capturing this knowledge and experience of our common people in various parts of the country and make it available to others to learn from."*

- India 2020: A Vision For The New Millenium

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