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Editorial

MILES TO GO.....

This century is witnessing an exponential growth of science and technology the world over and especially in India. But one of the most often reported barriers responsible for low science visibility in news media is the reticence of scientists and academia for lack of effective science communication. Another important factor is the level of scientific temper among various cross sections of people including the politicians and policy makers. Scientific Temper does exist in corporates as well as the entities that claim to execute good governance, but mostly lop sided. Such fundamental hurdles should be overcome to adopt sustainable development philosophy, green economy and budgeting, bio-diversity conservation and management, etc.

In order to develop and promote scientific culture, we require to propagate science communication and science popularization on a massive scale. Unfortunately, our print and visual media are still lagging in publishing scientific news and spreading scientific culture. Of course some newspapers and leading popular magazines do it. Now it is time to think how can such science news be significantly scaled-up further networked and assisted with articulation that may attract common citizen's attention in much greater numbers than now. Can we think of creating or strengthening knowledge networks amongst research and development institutions to communicate science with greater frequency, accuracy and clarity about progress, strengths and success?

This journal, 'Science Communicator' was an initiative to bring about at least a little change in this context, to upscale and spread the depth and visibility of science and technology related development and leadership in our country through a concerted effort. It could successfully invite expert science communicators to publish science related news, views and research developments in a simple way. The contributions of Science

Communicator, I believe, is much significant with respect to CUSAT which is an exclusive Science and Technology University and especially when missions of the government focus on S & T led development.

This is the ninth continuous year that the journal is coming to your hands. I am extremely happy to be informed by communicators, journalists and academicians that the content has always been rich and valuable. As Editor, Printer and Publisher of this journal, I am proud to have succeeded in publishing this special edition of the Journal, which would be the last volume before my retirement as Director of Public Relations and Publications in CUSAT. I believe that our University has the mandate of dissemination of scientific information as one of its major objectives and will continue to do so. I express my heartfelt gratitude to all those who extended support and co-operation in taking the journal to its ninth year. The University authorities who helped in running this activity smoothly all these years deserve special mention. I expect better co-operation from all scientists and science communicators in this mission in future, since the ultimate goal is still at a distance and "I have promises to keep, and miles to go before I sleep, and miles to go....." (Courtesy-Robert Frost).



Dr. S. Anil Kumar

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REVISITING “RADIO RICE”: A CRITICAL EVALUATION OF RADIO IN DEVELOPMENT COMMUNICATION

T. V. Venkateswaran

Introduction

The people's protest against Special Economic Zones in various parts of the country stagnation in agriculture, import of food grains, the widespread suicide of farmers are all but the signs of simmering discontent in the agricultural sector. The perception that the “agrarian crisis” is more or less an outcome of “natural” calamities like drought or flood, about which one can do almost nothing, is often the framework in which the crisis is presented by the State actors, to hide their failings and lack of political will.

As Ramakumar¹ points out, “... public investment in agriculture, as a share of agricultural GDP, rose till the late 1970s, began to decline from the early 1980s and continued to decline in the 1990s up to 2004/05. After 2004/05, there was a moderate improvement in public investment, although this began to fall again after 2006/07. In 2009–10, the share of public GFCF in agricultural GDP stood at 3.2 percent, which was still lower than the corresponding share for the early 1980s,” leading to unprecedented agrarian crisis and rural distress. While the crisis is not uniform across space and time, the period 1997- 2003 saw stagnation, while the period since has seen some revival of agricultural growth, there has been a significant slowing down of the growth of output and yield of most major crops and crop agriculture and animal husbandry have become unviable for a large majority of the peasantry. Rural employment has grown more slowly during the period of reforms than earlier and nearly all the increase in employment has been of poor quality, characterised by informality and low earnings. The agrarian distress has been responsible, in the main, for more than a quarter million farmers ending their lives between 1997 and 2012. Agricultural economists have been expressing concern that “(1) The long-term growth trend in production and productivity of agriculture, considerably less than required to sustain the projected high overall growth rates in the coming decade, may actually be slowing down; and (2) the growing economic and social disparities between agriculture and the rest of the economy and between rural and urban sectors” as two major features of the current crisis.

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Professor M.S. Swaminathan, renowned agriculture expert has made a passionate call for moving from 'Green Revolution' to 'Evergreen Revolution' to meet the challenges faced by the agrarian sector. Asserting that the success of the green revolution was made possible by certain factors that worked in concert: "The revolution resulted from a symphony approach with four major components — technology, which is the prime mover of change; services, which can take the technology to all farmers, whether small or large; public policies relating to the price of inputs and output; and above all, farmers' enthusiasm promoted by the mass media," called upon the Indian media to resume their² "active participation in revitalising our agriculture and in safeguarding our food sovereignty." Swaminathan points out that enthusiasm the media reports generated among farm families on the opportunity created by semi-dwarf varieties of wheat and rice to enhance yield and income substantially engendered the green revolution. When experienced reporters from the print media and All India Radio visited the experimental fields of research organisations and took their message of success to farm families, Swaminathan noted, led to a widespread demand for the seeds of the new strains, which, in turn, facilitated timely policy decisions. "The media thus helped to convert a small government programme titled 'High Yielding Varieties Programme' into a mass movement". To tide over the present agrarian crisis, Swaminathan calls for the revival of the spirit of the 1960s in the media.

Among various media, Radio accompanies our lives and we use it for accessing plain information, cultural stimuli, hints for a discussion, campaign arguments, or just fun and entertainment. New forms of dissemination of audio contents (community radio, car radio, WorldSpace radio, web radios, streaming audio, podcasting, etc) have further increased the capacity of the radio to fill niches, in a cheap, open, and friendly manner. In many of these niches, we do find science programmes or science topics. Literature which specifically discusses the role of the radio in science communication in a critical manner is scanty both at national and international level³. Most of the existing works, in India, consist of small, micro level audience survey or impressionistic, anecdotal recounts of radio practitioners presenting their point of view in the proceedings from congresses and seminar⁴. For the first time an international symposium "Science on air: the role of radio in science communication" was held in Italy in 2004 to specifically discuss the science on radio, involving science radio journalists, researchers, and media experts from 16 different countries to discuss their journalistic practice and the role of radio in science communication⁵. Although historical perspectives⁶ have been investigated earlier, at European level, a book specifically devoted to the role of the radio in science communication⁷ was published only in 2005. In India few accounts of the institutional history of Radio exist⁸, only very few critically evaluate the policy changes⁹ and relate it to political economy¹⁰. Taking

Swaminathan's clarion call for media to pitch in the proposed 'evergreen revolution', the paper revisits the 'radio paddy' and contribute to the literature on radio and science communication in India.

Radio 'Nellu' (paddy) legend

In her address to the public, while laying the foundation stone of a television relay centre at Nagpur, on 10th April 1982, the Prime Minister of India Mrs. Indira Gandhi said,¹¹ "From the beginning, we have realised the importance of radio and television. By constant exposure to them, we now know that we can understand better through these media than by merely reading or hearing about them. These media add a completely new dimension to our understanding. They can therefore also help in putting forward our ideas and ideals before the people. Even now we have not been able to make full use of radio. The use of television has been even more restricted... When I was telling you about our agreement with NASA, I received a short note reminding me that in the district of Thanjavur in Tamilnadu (India), a new quality of rice was released, and the people named it Radio Rice because they had come to know about it through the radio. This is an example of how radio is becoming a part of our life.." signify how the 'Radio Paddy' legend¹² gave confidence and justified the means and methods of development communication of that era.

Hybrid paddy crop variety Aduthurai-27 (kuruvai crop ADT-27) became popular amongst the farmers of Tanjore, Tamilnadu, and the Kuruvai paddy production in Tamil Nadu went up by leaps and bounds to the surprise of many. The farmers having learned the technique of planting and cultivating this hybrid variety mainly through the regular farm programme of the AIR Trichy, colloquially refer to this variety as 'Radio Nellu' (radio paddy).

Radio and popularisation of science in India invariably evokes the story of 'Radio Nellu' (lit., radio paddy)¹³, of how when the high-yielding varieties of food crops, as a part of the Green Revolution, was introduced in the 1960s, All India Radio (AIR) established the Farm & Home unit to popularise the HYV, and how farmers showed great interest in learning through the broadcasts of AIR, reposed total confidence in the content of the broadcasts and reaped immense benefits by adopting modern farming practices, which were hitherto unknown and alien to them.

This story is often told, often without any critical examination, as an exemplar of how radio can be an effect medium for development communication, and how social change could be achieved through the 'development communication'. All India Radio's 'Media support to Agricultural extension, success stories of All India Radio'¹⁴, rightly so, proudly recounts the role it played in Green revolution and recounts 'Radio paddy' legend. During the Chennai AIR's 75th anniversary, an official

from the station recounted¹⁵ "The success of the green revolution and the family planning programme has been attributed to the medium. A variety of paddy, ADT 27 became known as 'Radio Nelli' (radio paddy)" "Averting that farmers programme are the "only service which is fully utilised by listeners because it closely related to their lives". Page and Crawley¹⁶ note the effectiveness of All India Radio in engendering the Green revolution in the countryside. Media experts like Kasbekar¹⁷ and Pavarala, V. & Malik, K.K¹⁸ have also given a prominent place to the 'Radio paddy' legend. Even contemporary media experts invariably recall 'radio rice' legend to expose the potential of community radio movement¹⁹.

Context: Agrarian Crisis of the 1960s

The spring of 1966, clearly showed that the Third Five Year Plan was a failure, over the five year period (1961–66), the rate of increase in national income was less than half the projected level, and per capita income showed no increase at all²⁰. At the same time, prices for all commodities rose by over fifty percent, and the particular price index for food grains climbed by more than 56 percent. By 1966 food shortages were so severe that movement of food grains across states and within states between different 'food regions' were banned, and statutory rationing was implemented. Even with these measures the price rise could not be controlled, the general price index rose by another 38 percent in 1967 and the food grains 44 per cent²¹. The problem was compounded by the burgeoning population growth. While the population growth rates were just 1 percent in the first half of 20th century, it jumped to 2.2 percent per annum since Independence, and the resultant demand for food could not be met by the Indian markets. That year was one of continuous popular turmoil, of economic discontent and political agitations provoked by spiralling prices, food scarcity, growing unemployment, deteriorating economic conditions and disenchantment of the newly independent Indian State for its failure to meet the aspiration of the common people even after the passage of two decades. In their famous book, *Famine 1975*, Paul and William Paddock (1967) predicted that India's case as hopeless and predicted that it could not be saved from hunger and famine. Thanks to Green Revolution, today India has 60 million tonnes of grain stocks, which include the quantities required for maintaining a minimum food security reserve and for supplying the vast public distribution network of fair price shops²².

To tide over the food shortage, the government banned invite of more than 30 persons to a wedding and Prime Minister Lal Bahadur Shastri even issued an appeal that every Indian should fast one day a week, to enable the government to balance the food budget. People in South India, who were unaccustomed to eating Wheat, were forced to switch their eating habit.

To meet the food shortage and to stabilise the prices, India was forced to import increasing amounts of food and signed an agreement with the USA under the PL480 to import food grains, on rupee payment and at relatively low prices because the country had no foreign exchange to buy food in the world market. During 1966, over 10 million tonnes of wheat was imported. Although the USA signed the agreement for food exports, it kept the shipment of food grains to India on a tight leash as leverage to arm twist India to change its Non-alignment principles, independent foreign policy and criticism of American war in Vietnam²³. The food shortage was so much so that the arrival of the PL480 ships carrying food grains was a story in the media, as the PL-480 ships docked, the market prices for rice and wheat eased, and the "ration shops" would open and millions of people were able to eat. US President Lyndon Johnson uncharitably commented that India was living from 'ship to lip'.

At the time of independence, India's agriculture was in a state of backwardness, with productivity per hectare and per worker was extremely low. With just seven tractors per lakh hectares of gross cropped area in 1950-51 and just 0.66 lakh tonnes of fertiliser use in 1952-53, the techniques employed were age-old and traditional. The low productivity implied subsistence agriculture, and about 45 percent of the total consumption of farmers came from their production in 1951-52. Given the food shortage and resultant social upheaval, the government had to act; at least give an impression that they are in right earnest to ameliorate the worsening conditions of the rural masses. In the area of farm sector, the government posited that the problem was productivity and felt that the "acceleration in agricultural growth requires action, on several fronts including raising the level of investment, resolving problems of land tenure, increasing availability of credit, ensuring appropriate pricing policies and developing new technologies to increase productivity."²⁴

Food problem arose primarily from a deficiency on the production food grains mainly rice, wheat and millets which contributed to 70-90% of the total food requirements of the people. Seven out of ten people were then engaged in agriculture, and eight out of ten acres of cultivated land was used for the production of food grains. Despite that, there was a severe shortage of food grains. Until the Third Plan, the emphasis of the Government of India was on using the traditional techniques and skill, by focusing on the extension of irrigation, agricultural extension and community development programmes to enhance the productivity. As these efforts failed to yield results, a new strategy for agricultural development, utilising the High Yielding Varieties (HYV) was initiated during 1966-67 that heralded the era of the Green Revolution in the Country.

Quest for improved rice variety

Rice is one of the staple grain used in South India and south-east Asia, and the research for a developing a high-yield variety of rice began

in the 1960s when most Asian countries, including India, were reeling under recurrent famine.

The rediscovery of Mendel's laws of heredity attracted the attention of the rice breeders in some countries to the study of the inheritance of qualitative characters. Although efforts were made initially to develop only marginal gains was possible as there was poor institutional arrangements for regional testing and multiplicity of varieties. The founding of the International Rice Commission, of United Nations Food and Agriculture Organization (FAO) in 1949, ushered in several regional projects, such as cataloguing and maintenance of genetic stocks and made possible cooperation in the rice breeding. This enabled the possibility of japonica-indica hybridization, cooperative variety trials, wide adaptability tests, variety-fertilizer interaction in the indicas, and uniform blast nurseries and provided an international approach to the basic problems of low rice yields in the region and prepared the ground for the major gains of the 1960's²⁵.

Japan with limited land had to find a way to grow more food from almost the same amount of land to meet the growing demand from the burgeoning population. It is the Japanese scientists who pioneered the development of HYV rice. Even if modern fertilisers and improved irrigation were applied, the productivity of the traditional long-strawed tropical rice plant did not increase substantially. While the productivity of the Indica rice varieties, native to India, remained stagnant for a long time the Japonica varieties cultivate in Japan gave two to three times more yield than indica; Japonica varieties were even yielding over five tonnes a ha, while Indian varieties gave just one tonne to two tonnes a ha. Japonica varieties were able to utilise more nutrients and convert them into grains. For example, to get a yield of one tonne of rice, the plant would need about 20 kg of nitrogen and other appropriate nutrients. On the other hand, the indica varieties had slender straw, which when given mineral fertilisers, the increased number of the grains became too heavy for the thin straw to hold, and hence the paddy plant tended to lodge.

Chemical fertilisers provided the much needed extra nitrogen that the plants required for lush growth. However, the very same extra nitrogen caused the rice plants to elongate the stalk, which, then was not able to hold the weight of the heavy grains. Agricultural scientists understood that the architecture of the tropical rice plant, tall, with long, weak stems, was the main constraint and it "lodges," or falls over when the improved varieties of the plant produce more grains. When the plant lodges, grain rots in the water, or rats eat it. Japanese agricultural scientists found that if they could create semi-dwarf or dwarf varieties, that would convert nutrients to grain and hold the panicle (the terminal shoot of the rice plant that produces grain) upright then they can get over the problem of lodging and increase productivity.

Under the International Rice Commission Central Rice Research Institute (CRR), Cuttack, India was selected as the centre for making the crosses, and the growing of the F₁ plants and the F₂ seed from the crosses were dispatched to participating countries for further selection work. All the countries of tropical Asia participated in the indica-japonica hybridization project by sending the seeds of their best varieties for crossing with japonicas. Dr Krishnaswami Ramiah, an eminent rice scientist, suggested that the cross of japonica varieties of rice obtained from Japan with indigenous indica rice varieties would provide a breakthrough in the productivity of rice in India. Along with the international programme, CRR developed a parallel project supported by the Indian Council of Agricultural Research to cross the japonicas with rice varieties from several rice-growing states. He was the first scientist in India to begin the systematic hybridization program in rice. Prior to the first crosses, he made in 1917-18, rice varietal improvement in India was mainly limited to purline selection.

Japonica flowered very early, taking 58 to 70 days to flower at Cuttack, while indicas took from 95 to 100 days. Restricting day length to 8 hours in 30-day-old seedlings of indica parents for three weeks and planting japonicas all the year round enabled breeders to synchronise the flowering of both parents so they could make crosses. Pursuing interspecific hybridization, induced radiation and chemical mutagenesis and use of plant growth regulators, the aim was to get indica-japonica rice crosses, that would be functionally responsive to external application of fertilizers at the same not grow tall and remain semi-dwarf, without reducing the length of grain-bearing panicle. Initially the results were discouraging as most of the cross that that agricultural scientists were able to breed were not able to adapt to the tropical climate of India. Nearly all of the japonica parents were from Japan and were poorly adapted to a tropical climate. However soon one of the crosses, long-strawed ADT 27 showed substantial improvements over local varieties in India. Developed at the Rice Research Station Adduthurai, Tamilnadu, the new ADT27 was hybrid selection from a cross between japonica variety Norin8 and GEB24 a popular improved variety of Madras. It is also noteworthy that the ADT 27 is also one of the parent of another popular HYV of rice, CO-33.

The place: Tanjore

A predominantly delta area lying along the coast of the Bay of Bengal, Thanjavur, formerly Tanjore, is one of the districts in the erstwhile Madras Presidency of British India. It covered the area of the present-day districts of Thanjavur, Tiruvarur and Nagapattinam and the Aranthangi taluk of Pudukkottai district in Tamil Nadu. Tanjore, the proverbial "rice bowl" in Tamil Nadu State and it alone accounts for nearly one-fourth of the total acreage under paddy and more than a quarter of the total output of paddy. Tanjore district has been historically benefited by the availability

of natural flow irrigation from some rivers which pass through the region. The largest of these, the Cauvery, has a length of 500 miles from its source in neighbouring Mysore State to its outlet in eastern Thanjavur.

The Three Year Intensive Cultivation Plan for improvement of agricultural output, in particular, rice, in the then Madras state (later to become Tamil Nadu state) was initiated in 1949-50. Subsequently, Intensive Agricultural District Programme (IADP) P was launched in 1960/61 was to increase farm-level productivity by making available and encouraging cultivators to adopt a package of improved agricultural practices. Tanjore was chosen as a site for the IADP precisely because of its relatively assured irrigation, good infrastructure and relative non-occurrence of natural hazards. When the Indian Agricultural Development Programme was first introduced in 1960-61, there were 9,41,000 cultivators and farm labourers dependent on a total cropped area of 14.58 lakh acres for their livelihood in Tanjore. The availability of land per adult worker was only 1.5 acres in Tanjore making it one of the lowest land-man ratios in any region of India. In 1966 -67, following the national policy, High Yielding Varieties (HYV) programme was launched, and Tanjore was once again selected as one of the sites in Tamil Nadu state.

The HYV programme aimed at rapid maximisation of agricultural production from crop especially rice and hybrid millets. In 1970 Indian farmers planted 15 percent of their rice land with HYV seeds, but by 1980s that figure doubled to one-third of the land. Yield also dramatically increased to a range between 1000 to 1300 kilogrammes of rice per hectare during this period²⁶. It is significant to note that the rice production in Tamil Nadu increased from 35.24 lakh tonnes during 1965-66 to 45.32 lakh tonnes in 1968-70 and the programme were implemented in an area of 12.80 lakh acres during the year 1967-68 and in an area of 17.70 lakh acres during the year 1968-69. New varieties of high yield potentials like ADT. 27, Co 25, Co 29, IR 8, IR 5, IR 20, IR 22 were introduced as part of the programme.

In particular, in Tanjore, the Indian rice hybrid ADT 27 which took just 105 days to mature, as compared to 140-160 days for traditional varieties, was found suitable for the short season of Kuruvai by the cultivators. During the very first year, when the strains were released, '441 progressive farmers' adopted ADT27 in '5000 acres'²⁷. The shortening of the cropping season, provided the opportunity to convert most of the single-cropped are into the double-cropped land from the proportion of 1:2 to 3:1, i.e., an increase from 3 lakh acres out of 12 lakh acres to 9.0 lakh acres out of 12 lakh acres. It should be noted that the new Mettur Dam was opened in 1965, ensuring water for the second or even third crop in the Tanjore farmlands. 'About 5,000 tonnes of seed of this variety have been procured this year to cover two lakhs of acres in the next kuruvai season in Thanjavur,

besides nearly sixty thousand acres in other districts²⁸, reported the Chief Minister of Madras state. The farmers who adopted to ADT 27 saw that against the usual kuruvai yield of 2400 lb, the improved ADT27 provided a bountiful yield of 3840 lb of paddy. When in the 1965-66 improved new variety was introduced although the weather was poor in 1965-66 and 66-67, ADT 27 caught on quickly with the result that the area under the Kuruvai cultivation almost doubled by 1967-68. On average between 1967-68 to 1969-70, during the kuruvai season ADT 27 constituted 23.53 percent and the local variety just 1.88, and during the samba and thaladi seasons, CO25 was dominant. The Madras Journal of Cooperation²⁹ was livid, it exclaimed, 'A Japonica Indica Paddy, named ADT. 27, released last year [1965]for pilot trails and cultivated over 5,000 acres this year in the Kuruvai season in the Thanjavur delta'. Seeing the success of the ADT27 and inspired by the information given through the All India Radio farm programmes and the extension support from the agricultural department, by late 1966, more than '300 thousand individual farmers in Thanjavur district in Tamil Nadu made the decision to plant a new paddy variety, ADT-27 in order to grow two crops of paddy in the same amount of land³⁰, thus increasing the productivity. A project officer of the IADP was well satisfied with the progress³¹, just within three years of the introduction of the new variety, Thanjavur farmers took to ADT27, in 3 lakh acres out of the 9 lakh acres. Experts were exhilarated with the results 'The net addition of 1.4 lakh tonnes to the granary of Tanjore during a single season, apart from consolidating the gains of the past year, constitute the new hope for agriculture in Madras.³²

Radio arrives in India

Radio has a long history in India. The first radio broadcast in Indian soil was started way back in June 1923 as an amateur activity by the radio club set up in Mumbai which was soon joined by a similar radio club started putting out programmes from Calcutta in November 1923 and from Madras in 1924. The Indian Broadcasting Company (IBC) was started on July 23, 1927, in Mumbai and in August the same year, the Calcutta station of IBC was inaugurated. The IBC, however, had a short life. It went into liquidation on March 1, 1930. In 1935, Dr M.V. Gopaldaswamy, Professor of Psychology at Mysore University started experimental transmission from his residence. The station, with grants from the Mysore Municipality and with private support continued its service until 1947 when it was taken over by the Mysore State. The forerunner to the present All India Radio was the Indian State Broadcasting Service under Department of Industries and Labour that commenced experimental broadcast since April 1, 1930. The Department of Controller for Broadcasts was constituted in March 1935 and in June 1936, the Indian State Broadcasting Service became All India Radio. In 1941 All India Radio came under the Department of Information and Broadcasting.

With the independence of the country an only matter of time, the Subhas Chandra Bose Congress President, set up the National Planning Committee for independent India with Jawaharlal Nehru as its Chairman in 1938. Of the several committees and groups have been formed to examine the path of development to be taken by the Indian state before and after Independence, the sub-committee of the National Planning Committee on Communications examined the case of Radio, which had become a powerful mass media during the World War II. The sub-committee said "Communication and broadcasting are public utility service affecting the well-being of the community and are at present under State control. They should be public monopolies and should be run on commercial lines and developed intensively, subject to the paramount consideration that they are social services and as such powerful agents in the task of national development". It recommended the setting up of a statutory corporation for radio broadcasting with an Advisory Council consisting of representatives of the public and experts attached to it. Soon after India's independence from the British rule in 1947, the first Prime Minister Jawaharlal Nehru (March 1948) said that he was in favour of a broadcasting set-up similar to the British Broadcasting Corporation (BBC), but at the same time, many politicians and bureaucrats felt that the time was not ripe for that yet.

In 1947 there were just six radio stations in India, at Delhi, Bombay, Calcutta, Madras, Tiruchirapalli and Lucknow, while three, Peshawar, Lahore and Dacca, went to Pakistan. At that time AIR had a coverage of just 2.5 % of the area and 11% of the population. Today AIR is one of the world's biggest broadcast network with more than 262 radio stations that broadcast in 23 languages and 146 dialects catering to a vast spectrum of socio-economically and culturally diverse populace and having a coverage of nearly 92% of the total area. It is estimated that there are 104 million radio households and 111 million radio sets in India (Audience Research Unit, 1995). In addition the External Services Division are broadcast in 11 Indian and 16 foreign languages reaching out to more than 100 countries, to inform the overseas listeners about developments in the country and provide a rich fare of entertainment as well. Officially known since 1956 as *ĀkāshvāGī*³³, All India Radio's motto is summarised as "Bahujan Hitaya, Bahujan Sukhaya" (benefit and happiness to largest sections of the people).

Radio for rural broadcast

"India offers special opportunities for the development of broadcasting. Its distances and wide spaces alone make it a promising field. In India's remote villages there are many who, after the day's work is done, find time hangs nearly enough upon their hands, and there must be many officials and others whose duties carry them into out-of-the-way

places where they crave for the company of their friends and the solace of human companionship. There are of course, too, in many households, those whom social custom debar from taking part in recreation outside their homes. To all these and many more broadcasting will be a blessing and a boon of real value. Both for entertainment and for education its possibilities are great, and yet we perhaps scarcely realise how great they are. Broadcasting in India is today in its infancy, but I have little doubt that before many years are past, the numbers of its audience will have increased tenfold, and that this new application of science will have its devotees in every part of India³⁴ said Viceroy Lord Irwin speaking on the inauguration of the Bombay station of the Indian Broadcasting Corporation (IBC) on 23rd July 1927. The role the radio broadcasting could play in the informing, educating and entertaining was well known from the heydays of Radio broadcasting in India. Thus right from the institution of Radio in India, it was presented as a medium for development.

Ironically the colonial experiments in the rural broadcast were inspired by the Soviet experimentation of using mass media for education and empowerment of masses leading to the creation of 'new man', the cherished goal of communist ideology. The communists in Soviet union were conspicuously unsuccessful in spreading their literature among the peasants, given the widespread illiteracy and disrupted communications. Radio was seen as a boon to the Communists of the Soviet Union as one could instantaneously disseminate information over a large distance. If the radio listeners are gathered at one place and made to listen to the programmes, then it can act as a collective organiser. Lenin showed great interest in Radio broadcast, and subsequently, Soviet Union inaugurated the scheme to broadcast instruction and ideological education via public receivers to peasants and urban workers undergoing transition³⁵.

C.F. Strickland, formerly an official in the Punjab, was one of the early advocates of the use of radio for rural broadcast. During the early 1930s, he formed Indian Village Welfare Association wrote and lectured extensively on the subject in and around London during to garner support and finance to his dream project. Presenting rural India as 'isolated' and 'dull', treating the rural Indians as 'simple but inflammable', he argued radio could be a means by which the Imperial powers could reach the vast distances and remote regions. He said³⁶ "The position would be entirely changed if those lonely masses could be advised, taught, and amused using broadcasting" and called upon to emulate the Soviet Russia. He asked "Soviet Russia, finding itself in the face of a somewhat similar problem, has installed countless receivers in schoolrooms or other accessible spots in villages, and conveys to people not only its political propaganda but also a stream of genuine adult education. Weather news, market prices, agricultural advice, health advice, information about Russia

and the world, culture and lighter items, all these enlarge and brighten the village, and mould the mind of the mujik. Is it not practicable to follow the same policy in India?"

Inspired by the arguments, the North-West Frontier Province Government introduced village broadcasting early in 1935. Partnered with Marconi India, who offered the Government of the North-West Frontier Province the free loan of a transmitter and some village sets, on the understanding that the whole equipment would be purchased after a year's trial if found satisfactory. The receivers were specially made to withstand the dust and heat, and further, they gave a volume of sound high enough to be heard at hundred yards distance. Thus the broadcast was literally 'forced' on to the villagers.

But the most influential pioneer of British sponsored rural development and community broadcasting was Frank Lugard Brayne, who as District Commissioner of Gurgaon district in Punjab in the 1920s singlehandedly masterminded the official model of village uplift. Posted as Rural Reconstruction Commissioner, Punjab in 1935, Brayne boldly prepared a scheme of village broadcasting to be radiated by the Delhi Station, which finally went on air in June 1936. Brayne, had argued earlier in 1929, that "if there be immediate contact with every village for one hundred miles, [say through Radio network, then], [I]nstructions, announcements, warnings of pests and epidemics, all sorts of news, information and advice, and all the hundred and one things one wants to tell the villagers..... would be possible"

The essence of the village broadcasting was a radio receiver connected to the village loudspeakers, blaring paternalistic messages prepared in faraway Delhi or Presidency capital, rather than programming emanating from the rural areas. If the British state sought to promote private listening in England as a domesticating check against the mob mentality, for rural India, it suggested public listening to a single receiver which most likely was placed under the custody of Traditional village leadership³⁷.

An evaluation by the Controller of Broadcasting in 1939³⁸ noted that talks given were too long and too difficult for the villagers and the entertainment part of the programme were not sufficiently attractive or well designed to gain his full attention both in the Punjab and Peshawar experiments. Further, it also noted that the "Villagers tended to regard the radio with suspicion, as a possible means of taxation or instrument of propaganda".

Radio, it was thought, could be employed to keep the Indian peasant content in his natural habitat making them refrain from being part of the national movement galvanising during those periods. The rural listeners were expected to congregate in the village square or headman's

courtyard to hear official 'uplift programming' in the local vernacular blaring from a community receiver. Instead of flooding the rural airwaves with metropolitan influences, the radio was to offer a utopian image of the village brought to its potential with clean water, fat cattle, sturdy crops and vaccinated children. Unlike the transformative visions of Soviet mass media efforts, the village broadcasting efforts of the colonialist were but one feature of a broader development project which sought material improvement within the traditional confines of village life, without necessarily altering it³⁹.

As independent system Village Radio Broadcasting was short lived, it was subsumed under the expanding government of India controlled All India radio network by 1937. With their demise went the colonial commitment to village broadcasting, only to be resurrected as part of the five-year plan in 1950 by the Independent India.

Radio for development

Since its invention in the 1920's, Radio has been used to educate as well as entertain. England instituted "Farm Forum" in the 1930s, which spread to Canada and later India, that proposed to use the radio to disseminate agricultural information to the farmers. While the early attempts were radial in nature, that is one transmitting station producing the farm programmes and broadcasting it to the larger region, since "development decade" of the 1950s, feedback from the listeners were seen as an integral part of the radio programming. In 1956, with the assistance of UNESCO, a unique experiment for farm communication experimented. Titled "Listen, Discuss and Act", the project envisaged organisation of Farm Radio Forums in 150 villages across five districts of Maharashtra to establish a two-way communication between village audiences and experts through radio broadcast.

With the motto, 'Read, Listen, Discuss, Act' the Canadian initiative to harness the radio for stimulating farm sector rejuvenation was launched in January 1941 as an innovative partnership among three newly-formed organizations: the Canadian Association for Adult Education (CAAE), the Canadian Broadcasting Corporation (CBC), and the Canadian Federation of Agriculture (CFA)⁴⁰. The farmers were organised into local level listeners groups, Canadian National Farm Radio Forum, and the weekly radio broadcasts were supplemented with printed educational materials that were mailed in advance to registered rural discussion forums. Discussions and the reports send back from the farm/village level discussion groups to the central offices of the National Farm Radio Forum indicating its popularity. In its heyday the Canadian model served as an exemplar⁴¹ and inspired the Indian experimentation⁴², yet the Canadian project was shut down in April 1965, largely due to the three organisations diverging in

their main objective and organisational as well as a mobilisational lacuna in the local level farm associations⁴³.

Rural radio in Independent India

Inspired by the apparent successes of mass media especially in recently concluded II WW, overwhelming belief in mass media and its perceived role in development and nation building got entrenched. The Nehruvian state had emphasised the crucial role of communication in its mission. The institution of the planning commission and centralised approach to planning made imperative that massive publicity and propaganda of the plans and programmes are carried out to the people. The then emerging mass media, radio, was considered as suitable and fit for Indian conditions. Being largely an illiterate country with strong oral tradition, radio, it was assumed could reach last men (and in rare cases women). Technologically, by establishing transmitters at the district level, it would be technically possible to communicate all over the nation much more easily. The potential of mass media, especially radio was acknowledged right from the early days of inception of the modern Indian state. "Properly handled, the wireless can be made to mean for the Indian village such health, wealth and comfort as it has never known. Broadcasting can do more in a few years in the general spread of knowledge than all other methods of education put together in a lifetime"⁴⁴.

The central thrust of the first five-year plan document was to locate Radio for planned social change in India. All India Radio nodalised under the Ministry of Information and Broadcasting was given the task of 'improving' the masses by giving them not "what they sought to hear but what they ought to hear". AIR's broadcasting to rural areas was designed essentially to garner support for the national enterprise of all-round development, to carry information of practical use to villagers, widen knowledge of national ideals and to provide entertainment⁴⁵.

In 1965, Ministry of Information and Broadcasting, in consultation with Ministry of Agriculture and Education, decided to harness and leverage All India Radio as effective media for developmental communication, 'garnering support for the national enterprise of all-round development, to carry information of practical use to villagers, widen knowledge of national ideals and to provide entertainment' (Mathur and Neurath, 1959). Learning from almost five decades of rural broadcasting experimentation in the country, Chanda Committee concluded that "given the right approach and the opportunity to discuss and find solutions to local problems, the farmer is receptive to new ideas and techniques" (MIB, 1966:11).

Consequently, Farm & Home Units has established 10 AIR stations, viz., Jullundur, Lucknow, Patna, Cuttack, Raipur, Pune, Hyderabad, Bangalore, Tiruchi and Delhi during 1965, to provide suitable technical

support to farmers. The objective of the Farm and Home unit programmes was to provide timely and problem-oriented technical information on agriculture, in particular, popularise and spread the technology of the new HYV seeds, use of inputs, farm and home management, family health and nutrition to farmers and so on.

Each Farm and Home Unit was headed by a Farm Radio Officer, who usually had formal training in agricultural sciences and was supported by farm radio reporters, scriptwriters, programme executive and so on. The unit went mobile, travelling to villages and garnering the voices of the cultivators.

Given the high cost of the radio sets then, not affordable by the poor farmers, the scheme also envisaged provision of community listening sets in villages and by 1965-66, 1,50,000 receiving sets had been installed around the country in panchayath office, public places or parks⁴⁶. The perceived effectiveness of the services resulted in the establishment of the cell in all the regional stations of the AIR network, and the rural broadcasts are a crucial output of AIR (Baruah, 1983; Chatterji, 1991). Researchers estimated that additional output of 4 million tonnes of food grains in 1967-68 from the adaptation of new technology, which they estimated as more than a 'modest' impact of the programme of new agriculture strategy⁴⁷.

AIR Trichy and "radio paddy."

It is one thing to invent a new technology in a lab but to disseminate and ensure its adaptation in practice by farmers, is another matter. It is here Radio was thought as an appropriate modern medium to disseminate the information and technology widely to Indian farmers. Radio is a powerful mass medium, yet simple and cheap, used in education for disseminating information, imparting instruction and giving entertainment. It serves with equal ease in both developed and developing countries. It spreads information to a greater group of population thereby saving time, energy, money and manpower in an effective way. Due to its portability and easy accessibility radio could find its place everywhere whether it was a field, a school, a kitchen or a study room and was the obvious choice for effecting development communication.

When the new agricultural strategy of HYV was proposed to be implemented in Tanjore region, AIR Trichy was harnessed to provide the necessary communication support. The first radio transmission station in Tiruchirappalli was inaugurated by All India Radio (AIR) on 16 May 1939 by Shri C. Rajagopalachari the then Chief Minister of composite Madras state. 50 KW M.W transmitter was established in 1961. In 1965 the Farm and Home unit of the radio were established in Trichy AIR. All India Radio "began experimental broadcasts for farmers from the Trichinopoly station in June 1966 to adopt new yielding varieties"⁴⁸.

The experimental agricultural extension broadcast began in 1966 from Trichy AIR station with the view to persuading the farmers in the adjoining Thanjavur district to grow high-yielding varieties of rice. Radio broadcasts served as a link between the agriculture extension service and farmers. The Madras State had by then installed Community Radio sets in almost all the Panchayats and hamlets and more than 14,568 community radio sets were in existence⁴⁹. Of which, Tanjore district had 1588 panchayath and 109 hamlets, and in total 1677 community radio sets. In the Intensive Agricultural districts of Tanjore boasted more than 40,000 sets among the farmers⁵⁰.

Development support communication was devised by programme staff sensitive to the local population and conducted through the portrayal of situations in consonance with social realities. Manned by subject specialists, these special programme units, undertook field visits and recorded and broadcast first-hand accounts of the farmers, who started growing the new varieties of paddy and wheat. Other farmers could thus hear the authentic voice of the fellow cultivators. Agricultural scientists and officials of the State agricultural departments were involved in the formulation of appropriate information to the farmers so that at every stage of the farming practices. Cultivators could use the radio broadcast to understand the procedures to be followed to maximise the crop output at every stage of the agricultural operations. Discussion forums were set up the Trichy AIR and cultivators were invited to participate to clear the doubts about farming procedures. Many small and medium farmers took an active interest in the discussion forum, which was named "Radio Rural Forum" and were benefited by understanding the nuances of the modern methods of cultivation and integrated farming procedures.

One observer recalled vividly the communication strategy used for promotion of the new varieties in Tanjore region⁵¹. "The most striking example we encountered of the imaginative use of a local multi-media system of farmer education was in the Tanjore District of Madras State, an especially dynamic rice producing area with a double monsoon and two rice crops per year. The able and energetic District Agricultural Officer and his staff, on the basis of the latest technical research findings and changing market conditions, laid out a specific plan of action for each crop season, with recommended practices, week by week, to correspond to each phase of the crop cycle. A farmer education program guided by this plan mobilised all available media, methods and channels of communication—including radio, newspapers, bulletins, travelling exhibits, posters, and visits by local extension agents. Strong efforts were also made to get feedback from farmers. A particularly novel technique was the District Agricultural Officer's regular Monday morning staff meeting by radio, at which time he indicated the specific steps rice farmers should be advised to take that week in light of crop, weather and other conditions, and he then passed on significant

new research findings and other useful tidbits. The clever farmers in the district "listened in" on this staff meeting to get a jump on the latest research findings and other "hot news". The results of all these educational efforts were dramatically evident to any visitor.the farmers of Tanjore were an unusually dynamic group who valued new and useful technical information. The lesson is that it is much easier to run a multi-media knowledge dissemination system for farmers, or any other type of producers, where their particular field is on the move, and they are literally demanding new technical knowledge, and where there is a research system to generate it."

It is these 'science communication' activities that formed an integral part of the radio broadcast, over and above the agricultural extension information, that made the farmers, even illiterate one, familiar with words like endrin, malathion, phosphates, etc. In fact, one of the contemporary survey reports is amazed that the farmers were even familiar with the botanical name of the ADT 27⁵². One of the field survey⁵³ conducted by the Indian Institute of Mass Communication was amazed to find the farmers popularly called the ADT27 variety as 'radio nellu' (lit., Radio Paddy), so much so even the politicians and communicators started using 'radio Paddy' in their talks and writings⁵⁴.

Radio broadcasts were reinforced by interpersonal communication as well as publications and increased the flow of information between farmers and extension agents in both directions. The extension agents saw the value of making regular and frequent contacts with farmers and enjoyed the sense of continuity the programme gave them. Farmers tended to rely increasingly on the agents once they came to feel that the agents were dealing with their problems and needs on a timely basis. Moreover, because the messages dealt with specific problems, the farmers tended to remember them. Accordingly, the agents came to take more and more satisfaction in their work. In short, a felicitous self-reinforcing dynamism was involved.

Discussion

Swaminathan has been profusely having faith on Radio to bring about the change in Agriculture. He says "the Village Knowledge Centre (VKC) based on the integrated application of the internal and community radio or mobile phone will help to bridge the growing gap between scientific knowledge and its field application. It will also facilitate the removal of many intermediaries from the marketing chain."⁵⁵ and asserts "The mass media, particularly radio and local language newspapers, have been extremely important in the dissemination of agricultural information."⁵⁶ Even in the era of Television and Internet, Radio still has a place in particular amongst the disadvantaged sections⁵⁷. A survey conducted at the Ardh-Kumbh 2007⁵⁸, a religio-cultural congregation, it is observed after six years

of Maha Kumbh, in Allahabad indicate that while 70 percent reported that they had access to information through television, radio was not that much behind, with 68 percent reporting that they listen to radio.

Radio deploys familiar and most comfortable mode of communication: conversation, and hence, compared to other media, it can easily establish contact between the listener's personal experience (both practical and cultural) and the world of scientific knowledge. Thus Radio can be effective tool for science communication. Unlike print media, radio allows the audience to hear the voice of the protagonists, and their 'voices', thus creating a more intimate connection with the world of science and create a connect with the scientists. Radio is more relaxed than TV and permit reflective tempo. The stereotyped and standardized roles so frequent on television could not work on radio: we create our own opinion of the scientist we are listening to, basing it on his/her style and on what he/she is saying. No wonder, radio jockeys are able to earn trust of the people.

Although inspiring, Swaminathan's plea appears to be in vein. Growing urbanisation and metropolitan station, and the hyper-commercialisation of the media in the context of the neo-liberal policies have impacted upon the Indian media, and the Character and composition of the news media have been enormously transformed since the Green Revolution days. Except for occasional episodic reporting, problems relating to the rural poor, Dalits, and tribal folk, and Panchayati Raj activities hardly find a place today in most news media. With the prevalent management attitude and journalists disinclination towards rural poor, how far one can expect the media to rise to the occasion and play galvanising role it did in the heydeys of green revolution is a moot question. Rather than helping farmers increase production and productivity, the neo-liberal state is only opting for the soft option of importing food grains and does not even hesitate a bit withdrawing subsidies and a host of other benefits peasants have long been enjoying not is alarmed at the rate which farm lands are being taken over by industry. Thus it is not the media that is alone in the dock, but the State is squarely implicated at the neglect of the poor and rural population. Nevertheless, it is indeed important to examine the role media can and should play in development in the present context of the unprecedented contemporary agrarian crisis. Even the All India Radio's major countrywide campaign on the cultivation of these crops on a sustained day to day basis promoting HYV cultivation and modernization of agriculture, was virtually closed down by the government not filling up the vacant posts after 1977. The Farm and Home programme units that functioned from 1967 for almost ten years, slowly came to an end.

Was indeed the green revolution a revolution for increasing the food production as well as ameliorating the rural distress? At least for

some, the green revolution and the recruitment of All India Radio for the propagation of the new agricultural techniques were a means to suppress, albeit, in the cultural sphere, the then growing popularity of the Left ideologies. The selection of Tanjore, Palakkad, Alleppey, West Godavari districts was given a garb of 'already rich in rural infrastructure', hence most suitable for implementation of the GR technologies. To any careful observers, it is evident that they were also the places that saw militant left radical political movements in those days. The rhetoric of the mass media blamed the 'traditional' farmers for the distress and painted that being a progressive farmer and adopting the new technology is the way of the agrarian crisis. Ranganathan⁵⁹ noted, "people in Tanjore were dreaming not of ideological slogans and steel plants but an agricultural renaissance". Francine Frankel, social scientists, toured five agricultural areas of India in 1969 and examined the distributive and political impacts of the green revolution in her excellent book. She found that the success of the agricultural policy adopted in 1965 has given India the hope of escaping from its circle of poverty. At the same time, the increased rate of economic development seems to have exacerbated social tensions and accentuated disparities that may eventually undermine the foundations of rural political stability. Although Pinstrip Andersen et.al⁶⁰, had interpreted the results of the Green Revolution in adulatory terms, the promises of the higher productivity did not mean direct prosperity of the cultivator, the Mirasdars (non-cultivating, but owners of the land) increased the rentals of the land by about one bag annually over the years citing higher productivity rates with the introduction of the new technology. The majority of the cultivators experienced only minimal benefits from the introduction of ADT27. Farmers holding less than 5 acres were almost automatically excluded from converting single crop into double crop land. The cost of cultivating ADT27 was about 450 per acre compared to 250 for the usual varieties. Delayed or inadequate irrigation water would have resulted in heavy losses⁶¹. The benefits of new technology do not flow equally to all; was the radio reflecting on these aspects? If not and it was only presenting the new technologies in glorifying terms, then whose 'development' the radio permitted itself to be used?

The role of radio in the green revolution has been acknowledged. It is reported to have stirred the soul of the listeners and the new variety of rice ADT27 was adopted by the farmers speedily. Although the success of green revolution resulted in self-sufficiency in food production the arguments that address the high dependence on pesticides, fertilisers, shift towards mechanisation and demographic shifts cannot be lost sight of in hindsight. Despite the efforts to gather the voices from the ground, the philosophy of broadcasting and its use for development were primarily premised on providing exogenous expert inputs, and hence perhaps did

not pay much attention to the discontent at the ground level. The need for two communication should not be only premised upon listening from the ground to spin the campaign but should be a critical appreciation of the development programmes.

During the Nehurivian era the policy of the Community Development Programme aimed at addressing the developmental concerns of all the districts of India, however the claiming that such all India efforts dilute the scarce inputs to be diluted below the critical level needed to achieve significant increase in output, the new agricultural policy aimed at efforts focused on some select areas and regions. Application of scientific knowledge and techniques of agricultural production, the concentration of improved inputs in irrigated area and price incentives to cultivators were the three major cornerstones of the new agricultural policy. The rain-fed regions were largely neglected, which perhaps has a significant contribution to the overall low level of Human Development Index. Thus the new the agricultural strategy implied important concessions in socialist goals to the capitalist imperatives of resource concentration and price incentives; and perhaps, even a fundamental break with the egalitarian objectives that have motivated Indian planning since Independence.

Helen Haste, observes that in the contemporary times the capability of upstreaming controversies (that is, to encourage a dialogue⁶² "at an early stage in the process of new developments, when possibilities, problems, ethical issues and risks are being projected rather than at a point when public anxieties have become polarised" is presently a major challenge of science communication. The debates on most current controversial issues, from climate change to biotechnology to nanotechnology,; from nuclear power to modern agriculture, ⁶³ "cannot really avoid developing in conformity to the principles of the social environment, rather than those of the scientific world where it was conceived". Thus, as Mitchell⁶⁴ notes "The public increasingly takes science for the indefinite, political and often messy business that it actually is. Accordingly, we in the media can no longer get away with reporting science in the naive celebratory way we did 30 years ago". It implies, while we have to look at communicating through radio in terms of how it can enable ordinary people to make sense of their lives, to engage as citizens in their society, to get information it is most imperative to create a process by which people with varying opinions and views are able to express their voice.

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A STUDY ON THE DYNAMICS OF AUDIENCES FOR MASS MEDIA

Simi Varghese

Abstract

In a media-dense world, the term 'audience' has much significance. It has been used as a collective term to denote 'receivers' in mass communication process. As the established discourse goes, 'audience' simply refers to the readers of, viewers of or listeners to one or other media channel. Truly, it's one of the main fields of empirical research. The term 'audience' had entered into media parlance as an accepted everyday usage. But since its coinage, it had its stock of meanings, misunderstandings and academic conflicts. This study tries to explore the various dimensions in the field of mass communication research, especially audience research. It also describes and explains the basic tenets and different schools of thought in the field.

Critics argue that the simple word 'audience' is applied to complex and competing formulations. According to Walter Ong, 'audience' is a construct made up by the rhetorical situation the text is addressing. As American journalist Jeff Jarvi opines, 'Give people control of media, they will use it'. Biocca (1988) suggested that "what is occurring is the breakdown of the 'referent' for the word audience in communication research from both the humanities and the social sciences." Surprisingly, the term audience can be applied equally to the set of readers of early 18th century novels and to subscribers of 20th century satellite television services. This bears testimony to the appeal of the simple concept of 'audience'. On the one hand, audiences are products of social context and on the other hand, they form responses to specific dimensions of media provisions. Audience can be defined based on certain psychographic variables: place, people, medium, content and time. This simple term thus houses unlimited ambiguities and possibilities.

Genesis

The term 'audience' springs up from the early public theatrical and musical performances. The games and spectacles of ancient times too had its audience. Greece and Rome were the springboards where the concept of audience encompassed many features of today:

- a. events with a public and popular character

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- b. vicarious emotional experience
- c. specific roles as authors, performers and spectators

The concept of audience has been institutionalized more than two thousand years ago as a group of spectators for public events of a secular nature. Though it had a commercial base, the content varied according to social status and class. Literary and musical programmes solicited the more educated class while the majority attended fights, races, games, comedies and circuses. During early years, an audience occupied an 'auditorium', a space in which to hear and see what was going on and to respond directly. The audience in those days were interactive with performers. Audience of modern times exhibit certain differences regarding the concept of the term. Mass media audience originated with the printed book. A dispersed reading public appeared with the book. It was only in the 16th century, a reading public emerged comprising individuals who could buy, read, and collect books for their private purposes. Technological upheavals and societal changes altered the nature of audiences. The end of 19th century witnessed urbanization, rail transportation, sophisticated technology of printing, increased literacy and posh living standards. This revolutionized the cozy world of books and magazines into large-scale industries. Creation of new genres of audience based on technology became a prime objective in nurturing profitable media industries. But it was film which created the genuine 'mass audience', in the sense of large-scale reception of identical performances.

Audiences have always been fascinated by messages, news, films, information etc. In the 1920s and 1930s, media emerged as a powerful social and political force. This has been triggered by the political propaganda of Soviet Russia followed by Nazi Germany. The propaganda messages influenced even ordinary citizens which was not a possibility before the advent of mass media. New viewpoints have replaced older perspectives and the concept of 'effect' seemed more problematic in media studies:

- a. active audiences interpret media content.
- b. important role played in groups as audience members.

The concept of 'effect' has different ramifications in media studies as some degree of audience passivity is implied. Effects can also be of different kinds. Short term effects and ideological effects. Media effects cannot be gauged distinctly as media cannot be separated from other influences at work in society. Blumler and Katz (1974) have identified four needs satiated by viewers' watching television. Digression, domestic bonds, identity and surveillance are the typical needs. Audience structure their media usage patterns based on certain indicators (demographic variables) like age, income, education, sex, ethnicity, occupational status, household composition and size.

Types of Audience

Audiences differ in terms of location, time, space and context. The categories are:

- a. Immediate audience
- b. Mediated audience
- c. Universal audience
- d. Ideal audience
- e. Implied audience
- f. Mass audience
- g. Niche audience
- h. Individual audience

In the 50s and 60s, most of the audience were passive, but today they are more active. Passive theories expostulate that audience is often manipulated by media's empty messages. Active theories suggest that audiences are banking on media to satisfy their needs. They also question the content of any media before they believe any media text.

Knight and Ridden after a careful factor analysis of responses to an 84-question survey designed to get people's responses, came down to five factors – modernism, traditionalism, losing, coping and cosmopolitanism. They have also developed a simple psychographic set composed of the watcher, worrier, seeker and adventure types with their own unique characteristics:

- a. Watchers: They often avoid risks and are educated and responsible.
- b. Worriers: They move away from social and personal risk taking.
- c. Seekers: Though adventurous and daring, careful to maintain respect for traditional values.
- d. Adventurers: Well-educated and daring, ready to embark on a professional career with greater income.

Re-defining the contours of Media-Audience matrix

The media-audience bond forms the economic foundation of the commercial press. Recent studies reiterated that the relationship between audience and news media have steadily deteriorated. Since the end of the Second World War, newspaper readership has been on the decline. Younger audiences are showing great disinterest towards television news.

As Gillespie M. argued, 'audiences are complex, elusive, shifting social formations'. Gillespie unravels three main areas involving audience and media:

- the power of media relative to the power of audience
- media's role in shaping knowledge, values and beliefs
- new media technologies shifting the experience of the audience

The decades from 1960s to the 1990s witnessed relevant phases in the development of audience studies as observed by Brooker & Jermyn (2003):

- a concern with effects and uses and gratifications theory in particular
- with moral panics, a view revealing audience as victim
- emergence of active audience and its nature of 'activeness'
- ethnicity, fans and cults, spectatorship and female audiences emerge as new areas of interest.

Audience Theories

Two-step Flow Model

The two-step flow model has been devised by the minimalist scholars to show that voters are less motivated by the mass media and more by people called opinion leaders (clergy, teachers etc.) The model had actually replaced hypodermic needle model. Later the theory was developed into multi step flow model to simplify the labyrinthine web of social relationships.

Uses and Gratification Theory

Uses and gratifications emerged as an alternative theory that could study and understand media effects as a result of more complex process. Uses and Gratifications (U&G) is a psychological perspective which examines how individuals use mass media. Being an audience based theory, it's based on the surmise that individuals select media and content to fulfill their needs or wants. This is absolutely based on perceived needs, social and psychological characteristics, media attributes and experience related gratifications. The U&G theory focuses on the motives, attitudes and behaviours related to media consumption.

Its origin can be traced to Harold Lasswell (1948) model of 'who says, what, in which channel, to whom with what effect'. Palmgreen (1984) encapsulated uses and gratifications research in six main areas:

1. gratifications and media consumption
2. social and psychological origins of gratifications
3. gratifications and media effects
4. gratifications sought and obtained
5. expectancy-value approaches to uses and gratifications
6. audience activity

The prospects of uses and gratifications model has applications in different media contexts. Schutz (1966) argued that inclusion, affection and control are the three interpersonal needs which influence all aspects of communication.

Encoding-Decoding Theory

Members of the Centre for Contemporary Cultural Studies in Birmingham, under the leadership of Stuart Hall considered his own Encoding-Decoding model relevant in studying the relationship between text and audience. Hall firmly believes that certain media texts (television programmes) contain dominant ideological discourses as the media producers draw situations from the wider society. This society is ideological in disposition. As there could be varieties of interpretations, often there is a possibility for inconsistency in audience's decoding the encoded meaning. But Hall firmly believes that texts often contain a dominant or 'preferred meaning' which restricts the possibility for varied audience interpretations. Hall's model identifies three readings of audience interpretation:

1. When the audience religiously follow the text, a 'dominant hegemonic niche' is established.
2. When dominant codes are accepted and opposed, 'negotiated' position is established.
3. When the preferred interpretation gets restructured with different attitudes, an 'oppositional' position is established.

Often, there is a chance for 'aberrant coding', where the text is interpreted in a highly deviant and unimagined manner. Hall's model is a path-breaking discourse regarding audience's interpretation of media texts.

Reception Theory

'The unity of a text lies in its destination, not in its origin' (Eco, 1981). Eco's words bear ample testimony to the fact that it's the reader's comprehension of the text which really matters and not the author's intentions while writing a text. Ethnographic studies conducted during the last 15 years have revealed the different dimensions of meanings, audiences produce under specific and varied conditions. While reading texts, audiences often shift between 'implication' (their expected behaviour in a situation) and 'extrication' (their release from that involvement). The critical distance often prevents over-involvement in the process. David Buckingham (1987) while analyzing children's responses to 'EastEnders' explains, 'by turns deeply involved, amused, bored, mocking and irreverent', and regularly shifted between these positions. Ien Ang (1985) has expressed in a similar way while writing about women's pleasure in watching 'Dallas'.

Audience activity is the core concept in uses and gratifications. As Blumler (1979) said, audience activity includes intentionality, selectivity and involvement of audience with the media. Vance Packard in 'The Hidden Persuaders' explored various ways in which advertisers attempted to 'manipulate' audiences. In 'The Power Elite', C Wright Mills had given four functions for media audiences:

1. to provide identity
2. to instil aspiration
3. to instruct how to achieve goals
4. to offer an alternative

Various political advertising campaigns in 1950s studied that the audience was not very passive and does'nt just consume what the programme producers blurted out. Regarding political advertising, audiences focused on the messages which reinforced the existing beliefs and dismissed those messages which contradicted their established ideas. Media impact is often a case of reinforcement rather than persuasion.

Audiences comprise different social groups with particular cultural norms, mores, values, attitudes and social relations.

Dimensions of Audiences

The Pew Research Center in a detailed survey in the US, explored the relationship between Americans and their media. Americans liked the local news, sports, entertainment, useful advertisements and editorials on particular issues. The Survey reported that Americans wanted something different in their news network: a broad scope, a concise format and in-depth coverage. They expressed satisfaction regarding the varieties of programmes offered by the US media sphere. The Pew Survey cited internet as 'central' to US media use, as one among four Americans use internet as a main source of news. But to a certain extent, the internet supports the traditional mass media as well. They tend to view the news through the lens of their own political beliefs. They adhere to a libertarian media system.

While dependence on television remains strong, the circulation of most newspapers is in decline in the UK. But figures reveal that the British can be still considered as a nation of enthusiastic newspaper readers, especially tabloids. Statistics unravel that the British are reading more daily newspapers than their US counterparts.

Russian media system exhibits many apparent features of the Western media, but the audiences are quite distinct. Russian media organizations are not independent political institutions. Here both state-owned and commercial media outlets are very much aware of the limitations on 'free speech' in Russia. The Russian audience considers

the role of the central media as consolidating, rather than challenging state power. In Russia, newspaper circulation is very low and internet usage is less common than in the US and the UK. State-run television enjoys high level of trust and influence, though Russians are aware of the bias on the news. A sizeable group of Russian audience believes that a 'neo-Soviet' model of audience reception may be appropriate.

Media outlets are diverse and so is the relationship between media audiences and the political sphere. Audience research in these three countries reveals several interesting facets of their media usage. Americans favour objectivity, British people feel comfortable with balance and Russians are obsessed with image rather than truth in mass media. In the US, national newspapers are losing political influence while local newspapers receive acceptance for fostering a sense of community fervor. But in the UK, national newspapers have more influence. Local or regional newspapers are less-developed there. National Radio news is not popular in the US or Russia whereas national radio news via BBC is very popular and highly influential in the UK.

Audience as a concept

Communication is a discipline encompassing political science, literature, economics, statistics, philosophy, psychology, linguistics and anthropology. The genesis is traced to Germany and the US in the twentieth century. The period reverberated with questions from the German sociologist, Emile Durkheim and the Chicago School of Sociologists. The questions were regarding the role of the press in society. By the 1960s, mass media had created 'mass' society and a 'mass' culture. Critical schools of thought in the US, Europe and Latin America questioned the commercialization and politicization of the mass media which they termed 'cultural' industries. The Frankfurt School of Social Research attacked mass media in the 1940s. In the 70s and 80s two critical schools of thought emerged in the field of media studies: the Cultural Studies' School by Raymond Williams, Richard Hoggarth and Stuart Hall and the Political Economy School led by Peter Golding, Graham Murdock and Nicholas Garnham. The period also witnessed the emergence of the active audience in reception research.

Depending on one's perspective of the role of communication, the term 'audience' encapsulates varied ramifications in society. If communication is seen as a commodity, the 'media audience' would be a potential market to sell products and services. If communication is a public service, the 'media audience' would be a dialogic community. If communication is a tool for propaganda, 'media audience' serves as the 'mass' that needs to be indoctrinated. Sociologists define audience as a 'conventionalized crowd' assembled together. Media audience on the

other hand is a collectivity, an aggregate of persons who are readers, listeners and viewers of different media. Audiences generally do not interact with media messages as a 'mass', but as a family, a cultural group, a social class, a caste or tribal group.

People exist in various social dimensions as audience. They have a sense of themselves, a sense of their own identity:

- a. Political identity - people exist as citizens and as members of a public.
- b. Social identity - people exist as exemplars of social roles (fathers, children etc)
- c. Cultural Identity - people exist as exemplars of social groups (Black, White, male or female)
- d. Economic Identity - people exist as consumers and members of an audience

The concept of the audience is a social construction – a concept brimming with varieties of meanings. Audience in media industries is said to be a conglomeration of potentially overlapping markets. The two ways in which audiences are constructed and function as markets : as consumers and as commodities. The idea of a media consumer is often referred to as 'a market type'. People who purchase and enjoy products of the media consider themselves as media consumers. There are three different ways in which industries describe market types: demographics, taste cultures and lifestyle clusters.

Demographics' is the explanation of a population pertaining to a set of social or sociological variables. Demographic categories range from age, race, income, gender etc. Often media conglomerates invest more money in market research to find out the likely market for their products. They eke out marketing strategies and advertising styles for increasing sales. For eg; Pogo Channel has more affinity for families with children.

'Taste Culture' is a totally different way of comprehending a market type. Here commitment of the audience member is more important than the demographic identity of the person. It's not always possible to define a 'taste culture' demographically.

But the most contemporary way of understanding a market type is through 'lifestyle clusters'. It's a judicious blending of consumption tastes and demographic divisions. 'Lifestyle cluster' forms a group which often has good purchasing power and buys specific brands and products of their choice. The 'yuppie' culture is cited as an example. It's actually a group of 'young urban professionals' (y-u-p). The lifestyle cluster group members have certain common characteristic features. All these changes

have kickstarted a 'new consumer society' with cultural and communicative repercussions. Another major breakthrough occurred when the new consumer society sought to 'rationalize' people's everyday lives by mobilizing people's desires and needs under the control of the new culture of mass media. Shaping people's consciousness, the new culture had taken people away from frustrations and unrest and instead instilled feelings of prestige, style and status. 'Self' assumes prominence in solving all social problems.

Apart from audience as market and commodity, audience can exist as cultural identities represented in the media. Walter Lippman (1922) referred to stereotypes in media as 'pictures in our heads'. It could be people's expectations of other people.

Stereotypes are psychological means of assessing the diversity of the world by categorizing the world into types. It also empowers people to respond to types rather than how to respond to individuals. Media have been successful in constructing people's identities. Taking cues from this, people have tried to construct a more fragmented sense of their own identity. In the new era, people are unable to construct stable identities. They are less unified than their older fraternity. They also lack commitment to any single identity.

New concept of Audience

Modern discourses argue that today, media audiences are 'constructed' and redefined. Audience identified by the advertisers is not similar to the audience perceived by media communicators. Audience is defined according to their interests, capabilities, attitudes, preferences, their cultural identities and social experiences. In his book, 'The Future of the Mass Audience', Neuman (1991) expostulates the push of new information and communication technologies towards more diversity and participation. Two other powerful forces resist the functioning of audience. The socio-psychological facet of media use and the mass communications industry exert pressure on the audience. Ranging from societies to small groups, audiences still reflect the structure, dynamics and needs of social formations. The technological prospects of convergence will increase the opportunities of customers. The new technology with its interactive nature will embolden the media 'sender' to serve the 'empowered' receivers. Democratic political processes will help to sustain the 'legacy relationship' between media and audiences. Truly, the notion of an 'active audience' has already been incorporated into the media 'consumption' and use behaviour parlance.

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IDENTITY CRISIS OF A THIRD WORLD CULTURE: A STUDY OF THE ROLE OF TELEVISION IN BANGLADESH

Diwan Rashidul Hassan

Abstract

Bangladesh is a developing country in all aspects- political, economic and socio-cultural. Even though it has a rich cultural past, its assertion is found only after its independence from Pakistan. Labelled as a third world country, Bangladesh as of now is going through an identity crisis. Being an Islamic Republic, the country is torn between orthodoxy and modernization. The onslaught of foreign television programmes has accentuated the identity crisis by exposing the huge illiterate masses to alien cultural mores. The present research is an attempt to dissect the issue of identity crisis, find out the role of Bangladesh Television, a government owned media institution in preserving and maintaining that national culture of Bangladesh and make proper recommendations.

Introduction

The year 2014 was important in the media calendar of Bangladesh. It marked the jubilee celebrations of the electronic media – Diamond Jubilee of Radio Bangladesh and Golden Jubilee of Bangladesh Television (BTV). Meanwhile, the present Government is spearheading the "Digital Bangladesh" campaign with an aim to eradicate poverty, ensure development and establish the people's right. The Digital Bangladesh aims at establishing rights of information, education and livelihood for the people of all segments of society. The vision of the present Government is to make "Digital Bangladesh" by 2021 and Bangladesh Television is working for it. The government is very enthusiastic in preserving the Bangladeshi culture.

Identity is a constructed notion about individual or a group in relations to other individuals or groups where the individuals or group is distinctly identified. It is not static notion. It changes with respect to time, space and nature of interaction with other individuals or groups. What one is today or in a particular period of time may not be anymore after a lapse of time accompanied by social, political, economic, and cultural

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changes. Even a change in the location of an individual has the possibility of attaining new identity. A deliberation on culture and identity is bound to face plethora of opinions that might further complicate ongoing discourses on these concept and related theories. Some might opine that culture connotes certain ways of life that are ideal for a particular society (Samson Kamei 2015).

Bangladesh Television is the state-owned television network in Bangladesh. It started broadcasting as Pakistan Television in the then East Pakistan on 25 December, 1964. The channel was renamed 'Bangladesh Television' after the country's independence in 1971. It launched its broadcasts in full colour in 1980. It telecasts various programs comprising drama, documentaries, musicals, education and information, including 14 news bulletins in English and Bangla every day.

The average transmission time is around 17 hours terrestrial and 24 hours through satellite on a day. BTV is going to open another channel 'Sangsad Bangladesh' very soon through satellite. BTV authorities rely on mixed programming system with an audience maximizing goal. Of the program contents, 92% are local and rest imported of which News(14.79%), education (5.03%), live programmes (11.95%), religious programmes (5.19%), health, nutrition and family Planning (4.49%) and Development and social programmes (13%), history and cultural programmes (1.14%), package (7.95%), entertainment programmes (18%), special programmes (2.76%) and advertisements (4.21%) and others (11.11%).

Objectives

The main objectives of the present study are:

1. To understand the dimensions of identity crisis in a Third World country like Bangladesh and find out the role of TV in changing the value system.
2. To know the impact of audience preference on TV.
3. To dissect the influence of alien programmes on the culture in a developing country.

Research Method

The study is descriptive in nature. In addition, it employs the technique of survey research for the purpose of finding out the reactions of the respondents, both common and professionals as to the effect of TV programmes on cultural values.

The researcher intends to consider education, profession and income as independent variables to categorize the respondents for the purpose of the study. The data collected are percentage analysed.

The researcher has used the cluster sampling method and the number of respondents selected for the study is 430 from Dhaka City. The cluster sampling has three stages, and the researcher at the first stage, has to identify the areas for sampling. For this purpose, keeping in view of the study and the profile of the Dhaka City in mind, the localities which had the concentration of educated people were identified. The localities thus selected were: Motijheel, Lalbagh, Ramna, Dhanmandi, Mohammadpur, Tejgaon, Gulshan, Uttara and Mirpur. The geographical area inclusive of these localities was divided into equal dimensional blocks. A random selection from these blocks led to the sample of a number of localities. From each selected locality a certain number of households were randomly selected taking into account the total number of households in that locality.

Apart from this in order to include a component of student representation in the sample, a sub-sample of students was taken using the official lists of students. Care was taken to select the students randomly and from the six prominent educational institutions located in the city. Random numbers table was used for purposes of random selection of blocks and households.

Hypotheses

The researcher has formulated these research hypotheses for the purpose of the study:

1. The BTV's cultural programmes have a positive impact on the audience in that they promote the Bengali culture.
2. The Western programmes of BTV have been successful in making the Islamic society of Bangladesh accept the western values.
3. Irrespective of the hold of religion, and their impact on religious beliefs foreign programmes of BTV make the Bangladeshis more and more materialistic.
4. BTV's Western programmes help modernize the common people.
5. The identity crisis of Bangladeshis has compelled them to seek increased telecasting of Bengali cultural programmes in order to preserve their culture.
6. The audience seeks more and more religious programmes to support their identity.

Analysis

The researcher has attempted to secure a representative character to the groups of respondents by identifying different types of them. For instance, among 130 professionals are included college and university teachers, lawyers, doctors, engineers, journalists, industrialists,

businessmen, bankers, security personnel and mass communicators and the like.

Of the other groups of 180 include Government employees, politicians, religious teachers, academic administrators, voluntary workers, artistes and housewives.

120 students were drawn up from the University of Dhaka, Bangladesh University of Engineering and Technology, Dhaka Medical College and Hospital, Dhaka Polytechnic Institute, Institute of Leather Technology and Central Law College.

Distribution showing categorization of BTV programme as cultural by the respondents

Table 1 Impact of cultural programme on audience

	Respondents
Promote the Bengali culture	50.22
Bring values of western culture	35.88
Help to modernise the traditional society	35.09
Raise the aspirations of the people	16.28

N = 430

The percentage exceeds 100 since the questions have multiple responses.

The statistics confirm the hypothesis No. 1 that the BTV's cultural programmes have a positive impact in the audience in that it promotes the Bengali culture.

Most debated controversy is the domination of western programmes over the media of Third World countries, especially, the TV. The exposure of natives to western values was agreed upon by the majority (74.65%), while a minority (25.35%) differed (Table -2). The ambiguity of respondents could be gauged from their opinion as to the acceptance of western values by the people. Those who said they would not accept the values were in majority, but the other group was also in significant number. The low income group ranked first among such acceptors followed by the students and youngsters. Higher age, income and professional groups topped in giving an emphatic 'No' (Table-2)

Notwithstanding the variations, the analysis of the tables presented rejects the hypothesis (No. 2) that the western programmes BTV have been successful in making the Islamic society of Bangladesh accept the western values.

Table 2 Acceptance of western values as seen by different groups

Variables	Yes	No
AGE		
18-30 yrs	49.50	50.49
31-40 yrs	36.05	63.93
41 yrs and above	29.24	70.75
SEX		
Men	41.00	58.99
Women	40.13	59.86
INCOME		
Tk. 25,000	57.69	42.30
Tk. 25,001-50,000	46.60	53.39
Tk. 50,001 and above	37.20	62.79
OCCUPATION		
Professionals	34.58	65.41
Others	34.46	65.53
Students	56.66	43.33

Western culture is identified with materialism in contrast to the eastern or the Muslim culture. At the highest philosophical level, easterners consider materialism as sinful. The respondents were sharply divided on the issue of western values introducing materialistic values into their society. As much as 46.28% of them concurred with such a view, but a large section to the tune of 38.60% of the respondents held the other view (Table-3). Prominent among them were again the younger age group and the students. Most probably, they did not identify western values with materialism, likewise, the middle income group. A significant portion of women to the tune of 22.36% remained undecided.

The table shown above confirms the hypothesis (No. 3) that irrespective of the hold of religion and their impact on religious beliefs, foreign programmes of BTV make the Bangladeshis more and more materialistic.

More than half of the respondents (53.02%) contended that foreign programmes would modernise the common people (Table 4). Daniel Lerner (1958) in his monumental work, passing of the Traditional Society, has stated that access to media increases the aspirations of the people to

modernise. Likewise, access to foreign programmes might kindle among viewers western values.

Table 3
Opinion of different groups whether Western programmes bring materialistic values

Variable	Yes	No	Can't say
AGE			
18-30 yrs	41.58	45.54	12.87
31-40 yrs	47.54	32.78	19.67
41 yrs and above	53.77	32.07	14.15
SEX			
Men	47.48	41.36	11.15
Women	44.07	33.55	22.36
INCOME			
Tk. 25,000	19.23	46.15	34.61
Tk. 25,001-50,000	47.57	38.83	13.59
Tk. 50,001 & above	48.17	37.87	13.95
OCCUPATION			
Professionals	48.87	39.09	12.03
Others	50.28	29.94	19.77
Students	37.50	50.83	11.66

Table 4
Opinion by different groups on foreign programmes as modernizing agents

Variable	Yes	No	Can't say
AGE			
18-30 yrs	57.92	28.21	13.86
31-40 yrs	50.00	31.14	18.85
41 yrs and above	47.16	30.18	22.64
SEX			
Men	55.75	27.69	16.54
Women	48.02	32.89	19.07
INCOME			
Tk. 25,000	53.84	30.76	15.38
Tk. 25,001-50,000	57.28	29.12	13.59
Tk. 50,001 & above	51.49	29.56	18.93
OCCUPATION			
Professionals	45.11	30.82	24.06
Others	43.50	36.15	20.33
Students	75.83	18.33	5.83

N = 430

N = 430

Common people prefer to become modern while retaining social obligations. The transitory phase from tradition to modernisation will no doubt generate an identity crisis. Of the respondents who considered foreign programmes as modernizing agents, the number was dominated by students. Once again those belonging to upper age and professional group tended to vacillate. Similarly, the women responded favourably.

When foreign programmes are considered agents of modernisation, how far the Bengali culture can withstand its onslaught and retain its original character? The respondents seem to have drawn a distinction between culture and modernity. They probably believe that modernisation would not affect their culture.

The inference drawn from the evaluation of responses approve the hypothesis (No. 4) that western programmes help modernise the common people.

The overwhelming response was the preference for more and more Bengali cultural programme on BTV and the list was topped by upper age, higher income and professional groups. Gender wise, equal number of men and women preferred the programmes on Bengali culture (Table-5). Caught between the attraction of foreign programmes and the apprehension of their domination, respondents in order to preserve their

Table 5
Group wise preference of programmes on Bengali culture

Variable	Yes	No	Can't say
AGE			
18-30 yrs	75.24	16.83	7.92
31-40 yrs	88.52	9.01	2.54
41 yrs and above	90.56	6.60	2.83
SEX			
Men	82.73	12.23	5.03
Women	82.89	11.84	5.26
INCOME			
Tk. 25,000	73.07	19.23	9.69
Tk. 25,001-50,000	81.55	12.62	5.83
Tk. 50,001 & above	84.05	11.29	4.65
OCCUPATION			
Professionals	89.55	9.70	0.74
Others	86.93	9.09	3.97
Students	69.16	19.16	11.66

N = 430

cultural identity and avoid further crisis have sought more and more Bengali cultural programme on BTV. From the above examination, the hypothesis (No. 5) that the identity crisis of Bangladeshis has compelled them to seek increased telecasting of Bengali cultural programmes stands confirmed.

Those who preferred more religious programmes constituted 49.07 per cent of respondents and those who opposed it was 44.19 per cent (Table-6). Here again the younger group and students were clearly opposed to the idea of more religious programmes indicating age as a deciding factor. They were followed by middle age respondents. Of the different groups, only upper age, higher income, and professionals supported the view.

Table 6
Preference for religious programmes by different groups

Variable	Yes	No	Can't say
AGE			
18-30 yrs	32.67	57.92	9.40
31-40 yrs	45.08	50.00	4.91
41 yrs and above	65.09	31.133.77	
SEX			
Men	39.92	52.15	7.91
Women	51.97	43.42	4.60
INCOME			
Tk. 25,000	34.61	57.69	7.69
Tk. 25,001-50,000	38.83	56.31	4.85
Tk. 50,001 & above	46.84	45.84	7.30
OCCUPATION			
Professionals	49.62	43.60	6.76
Others	54.23	42.93	2.82
Students	23.33	64.16	12.50

N = 430

Professional groups along with others and women sought more religious programmes. The responses indicate a clear trend of age and income as decisive factors in opinion formation. Since Bangladesh is an Islamic republic, the difference between the two groups of respondents, the one seeking more religious programmes and the other is negligible. However, we must note that the religion is not totally rejected, but an excessive dose is not preferred by the people.

Their preference for more and more programmes of Bengali culture on TV is defended by their expression of happiness, though technically, these might not be competing with foreign programmes. Once again, it helps them to retain their cultural identity, which is affected.

Summary

The present chapter has vividly described the views of the respondents and an interpretative analysis is attempted. The entire chapter is divided into various sections on the basis of media habits, respondent perceptions, views and trends besides the analysis of responses given by BTV officials. Lastly, an effort is made to link the views of common respondents with those of BTV officials.

The study has found out that films have been considered as cultural by most of the respondents. The younger age group and the students were more receptive to foreign programmes than others. While everyone feared the influence of foreign programmes in changing the values of children, most respondents vehemently asserted that foreign programmes on BTV would hardly alter their religious beliefs. The division of the society as commoners and elites was also accepted. The positive aspects of viewing foreign programmes lead to understanding of different cultures and modernisation of common people. TV was considered a powerful and effective medium to preserve the Bengali culture, which programmes are preferred more.

The religious programmes, most respondents said would create unity. Most BTV officials favoured the maintenance of status quo in the case of programme format. While the upper echelons in BTV were confident of their independence, others were equally sceptical. An interesting aspect of the study is the fact that most people appreciated the quality of foreign programmes, but had their own reservations in respect of their influence. They believed in the non-disturbance of religion, yet did not favour the telecasting of more religious programmes, a common element among both general respondents and BTV officials. Religion, a cultural institution, thus remained simultaneously favoured and disfavoured creating confusion in a mono-religious country.

Consequently, in the absence of a well-defined programme policy BTV has contributed its own mite for precipitating the identity crisis among Bangladeshis in the global context, who in order to establish their identity, hanker for increased telecasting of programmes reflecting the Bengali culture.

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EFFECTIVE WRITTEN COMMUNICATION ON RESEARCH FINDINGS: A SHARING OF THE EXPERIENCES OF FIVE DECADES

Prof. S. Sivadas

We live in a world of information revolution, knowledge explosion and communication miracles. Information is rapidly multiplying; knowledge is constantly expanding and new horizons of knowledge & technology emerge every year or in a fraction of the year. Management science is caught up in this mad race along with science & technology. As newer and newer research findings emerge, they cluster together to create new areas of knowledge resulting in new super specialities.

The result of such a wonderful explosion of knowledge is that even a professional who has been specialising in a knowledge domain find it harder to understand and appreciate the various research findings in his specialised area. In such a scenario, the specialised professional would not be able to even imagine the wonderful knowledge emerging in various fields which remain closely related to his domain and which are to be understood by him every now and then for a better assessment of his super speciality area. The result is that many professionals are really ignorant about recent findings and recent revolutions happening in his domain or neighbouring domains. Thus illiteracy is really more among literates or experts in some fields! This naturally becomes a strong hurdle for their growth and success in their career and their growth of organisations as well.

What is the remedy? A constant syphoning of the most modern research findings and present them in a format which could be easily understand and appreciated by all irrespective of their speciality and professional status and inherent knowledge level.

Yes, what is required is to change the dry hard facts in research papers to palatable, simple, enjoyable and exciting information. It is a type of cooking, just like you alter a mixture of vegetables & spices to different delicious dishes. We should cook information or knowledge and thus prepare fragrant, tasty, flavoured items of new ideas, knowledge and findings so that they are easily welcomed by one and all including the professionals.

Prof. S. Sivadas (Former Emeritus fellow for Science Writing & Communication, Kerala State Council for Science Technology and Environment & author of 165 books), Chief Editor, Labour India Publications, Email: ssvadas.prof@gmail.com.

As a science activist, educationalist and writer, trying to communicate with various groups from kinder garten people to management professionals and scientists, I have been experimenting and developing various creative techniques for lucid communication of knowledge to various target groups.

What is important is that no dilution of basic knowledge is to be effected during communication; but the knowledge is transformed so that it becomes simple, interesting, exciting and inspiring to the professionals to use it for a better management of his organisation.

This is not a new discovery; it was used even by Galileo to explain his revolutionary ideas to the people of his times, in his famous work 'Dialogue'. 'Leelavathi' the famous mathematics book written by Bhaskaracharya is yet another classic example of creative communication of a knowledge area which is normally considered dry and tough.

In fact, this author along with DrA.P. Jayaraman has developed a new format of Science communication known as "Creative Science Writing", where dry science is transformed to exciting literature which can be easily appreciated by children and grown ups.

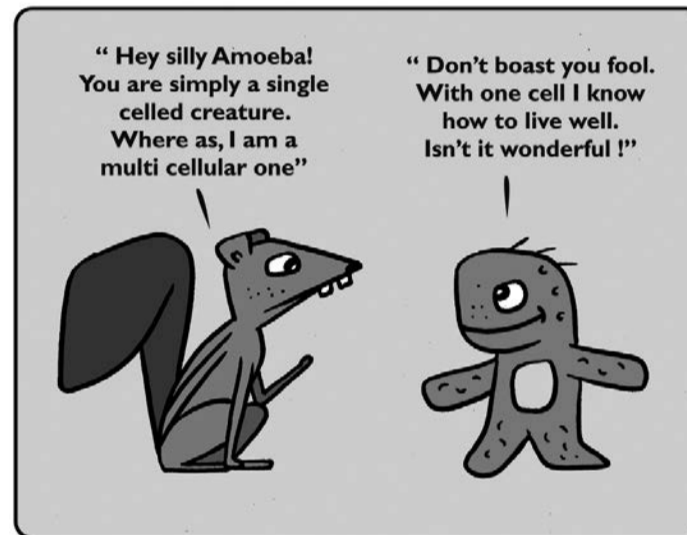
All formats could be effectively used for this sort of stories, riddles, puzzles, anecdotes, cartoons, skits, mind mapping diagrams, charts and illustrations. Stories are best suited to children, while cartoons with pungent comments are preferred by grown ups. Such comments could even become viral at this age of internet trolls. Why don't we use them even for communication of research findings if they appeal to even the old generations of people who often forget to smile? Yes, smile is a golden gateway to understanding a new domain of knowledge.

Communication, after all, is an art. Once Victor Hugo send a post card to his publisher with just a question mark (?).

He was on vacation, and was enquiring the impact of his famous work 'Les Miserable' which was just published. The publisher who was equally good at communication sent another post card to him in reply with just an exclamation mark (!). Meaning is that the reception for the book is enormous. This story proves that an imaginative communicator could use the minimum words (here no words!) and still succeed in the art.

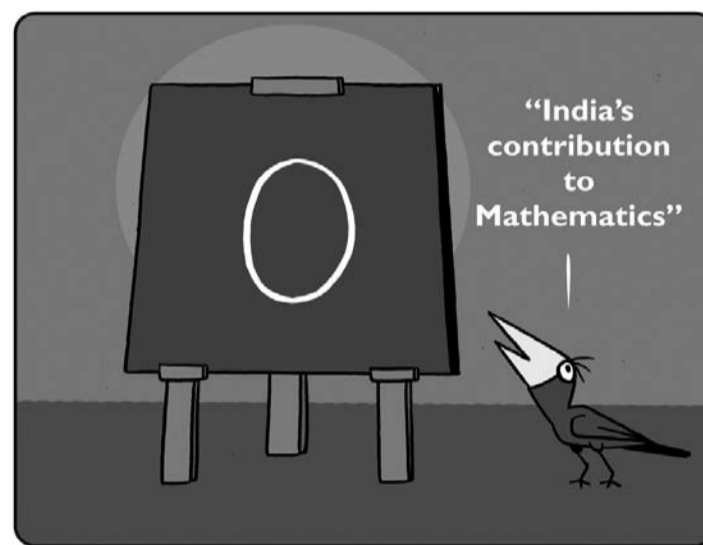
Once when I began writing a book on women and Nature to marginally educated women in a village, I started by asking a question! Which is longer? Monkey or its tail, your answer may be tail; but it is wrong. Tail is only a part of the monkey. Same is the case of woman (or man) who is only a part of the nature. If nature is destroyed, human beings too are at danger. Your begining sentence is important. It could arrest the reader's attention to the writing.

There are endless examples which one could give. To conclude let me give some cartoons as models to communication. They are self explanatory and hence don't require any comment. They exemplify the power of easy communication.



"Sir, What is
relativity of
time ?"





" Me the hand is the most important."



" No No ! It is me the leg most vital."



" Fools! as the CEO of this wonderful organisation, the human body, I command you not to quarrell. All of you are important and vital for the existence and growth of the organisation. Together we win, alone we die."



SCIENCE COMMUNICATION IN INDIA: CHALLENGES AND PROSPECTS

Nagaraj K. V.

Communicating science in a country like India is an arduous task because of *factors like traditional cultural values, religious and superstitious beliefs and lack of innovative ideas*. In addition, the masses are huge; educating them needs enormous manpower and persuasive publicity. Development of scientific temperament among illiterate masses is no doubt one barrier but educating the educated who still cling to superstitious beliefs is all the more difficult. The strangle hold of tradition on human beings is such that it is doubly difficult to change their attitudes.

To inculcate a scientific temperament, one has to employ all types of persuasive techniques and in turn make use of different media depending upon the region, language and context. Science communication has its *own brief but not-so- well documented history in India. It all, as usual, started with print media*. As a reminder as all of us know the early publications, for that matter, in any language focused more on literature and religious discourses. Science occupied an insignificant space even though mathematics and astronomy appeared at irregular intervals. It is only in the beginning of the twentieth century that science began to bloom and science communication started receiving attention after the Second World War.

This is especially true of developing countries like India. In terms manpower in science and technology, India stands third in the entire world. Even then, the status of science communication in India is abysmal. Innumerable factors are responsible for the flux that exists as of now. Science communication in real terms began as extension communication, propagating the need to change traditional farming practices in a scientific manner to increase agricultural produces to feed the hungry millions. The question initially was how to leap-frog the need-deficits and reach the level of industrial West. There have been debates and discussions on how to scientifically develop the agrarian societies without disturbing the social fabric. We shall at the same time not forget that politico-economic ideologies that particular societies have adopted will also impact the process of developing scientific temperament among their members. Let us discuss the issues related to science communication and the common solutions that are available to promote science in developing societies.

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Religious affinity and science are considered incompatible by many scholars. It need not be. With a deeper understanding of each religion, we can interpret them scientifically and influence the masses positively for adopting a scientific attitude. Mass media can play a pivotal role in this direction. Some scholars have criticized newspapers for publishing astrological columns. The reason is that they do not consider astrology as science. It is here one has to challenge its validity deeply embedded the minds of the people. For sure, there will be a tremendous resistance to new ideas as they knock the people out of their make believe world. Religion is often misinterpreted for certain bargains. Often, it also becomes a tool of power politics. The scientific aspects of religion should be demonstrated by the media. The *Speaking Tree* of The Times of India is a fine example of how religion can be interpreted to educate the readers. Religion is not anti-science nor is science anti-religion.

Science similarly is culture –oriented. Some societies accept culture immediately and others do not. The traditional and illiterate societies take their own time to adopt scientific thinking. In The North-Eastern parts of India, people have been killed on the allegation of practicing witch craft and the concerned state administrations have to carry on campaigns against murdering innocent people as practitioners of witch craft. The reformation of backward societies is difficult task. Media will have to use the tribal chieftains and other opinion leaders to re-orient the ignorant masses. This may be true of other parts of the country also. The recent Supreme Court order banning a certain practice in Tamilnadu has seen the political class dashing to circumvent the judicial pronouncement and pander to superstitious practices. In other words, science communication and efforts to inculcate scientific temperament demand a strong political will in democratic societies, which again depends upon the vote bank politics in a heterogeneous country like India. Of course, the political class represents the common denominator. It is also true that people are not always right. That is why Mahatma Gandhi asserted that one of the major objects of the media (then the print) is to expose popular defects. Such an initiative needs enormous courage. Unfortunately no media outlet has shown the courage to question people's ignorance, barring a few English language newspapers and TV channels. The regional media has to wake up to the new realities of the twenty-first century.

Apart from this, not many in the scientific community are good communicators whether speech or written. Their language is technical and complex. This is true in the case of both English and regional languages despite efforts by both central and state governments to train a brigade of science popularisation activities.

GENESIS AND DEVELOPMENT OF SCIENCE COMMUNICATION IN INDIA

N. Unnikrishnan Nair

Introduction

The topic deliberated in the present article has been discussed previously in several contexts, yet it is ever green because of its significance and dynamic nature. Science related news being less sensational covers only a poor three percent space in the Indian media, while the bench mark prescribed in developed nations is fifteen percent. A recent survey conducted on the aptitude of people in science related matters appearing in media, those evinced interest appeared to be twelve percent which is a four-fold proportionality over the space allotted to it. These facts vindicate the scope and need for understanding the developments and sources of science communication in this country. Though the development of science communications is a global wish, difference in the economic, political and cultural back grounds have a profound influence on the theory, method and practice of science popularization and therefore the Indian Scenario merits specific attention. The modes of communication considered here include the print media, audio visuals, folk media, interactive resources and various sources emerging from the application of information technology.

Pre-independent era

India had a good heritage in science, especially in astronomy, mathematics, chemistry, engineering and the environment but this was off set by the big gulf between scientific knowledge and the common man. Mostly, communication was in the form of *sabda* or verbal testimony in which the pronouncements of the scholar was accepted by the lesser minds. As a result there is no significant date or event of those days to be recorded in the history of science communication. Moreover, science communication as a separate discipline being of recent origin, one can narrate only events that have catalysed the growth and development of this new branch of knowledge. Four innovative milestones in this category are the first printing press in Goa in 1556, the news paper Bengal Gazetter from Culcutta in 1780, radio broadcasting in 1927 and the advent of television on a limited seats in 1959. The industrial revolution which gave a great surge to modern science did not touch the shores of India and therefore to get a glimpse of what happened elsewhere, books were imported to India and translated into different languages. These works

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marked to a great extent the awareness of modern science in India and can be regarded as major source of communication towards the dawn of the 19th century. The Asiatic Society was established in 1794 to pave way for direct interaction among researchers. Discourses among them in the form of journals seems to have begun in India with the *Transactions of the Medical and Physical Society*, Calcutta in 1823, about 125 years after the first journal was started in France. This was followed by the *Asiatic Researcher* in 1832, the *Indian Journal of Medical Sciences* (1834) and the *Indian Annals of Medical Sciences* (1853). The era of scientific journals in India have begun from these early initiatives. Science journalism had a modest beginning a few years earlier with the publication of the monthly *Digdarshan* in three languages English, Bengali and Hindi in the year 1818. The dawn of the 20th century saw a steady surge in the development of science and its dissemination to larger audience. Two notable events are the session of the Indian Science Congress in 1914 and the publication of the Proceedings of the Indian Association for the Cultivation of Science three years later. *Vigyan (Science)*, a monthly magazine in Hindi has been published by Vigyan Parishad since 1915. The ninteen thirties to the next two decades paved the foundations for some world class institutions and discoveries inspite of the colonial despendation existed at that time. the current Science (1932), Indian Academy of Sciences (1934) and the National Institute of Sciences of India (1935) were the remarkable achievements during this period.

Post-independence period

The vision of the architects of independent India was to forge a scientific culture that could penetrate its multilingual and multicultural society with scientific thinking and to reform it into a nation on par with the rest of the world in terms of scientific exploration and awareness. Several government and non-government organisations came into being obtivated by the constitutional obligation "to develop scientific temper, humanism and spirit of enquiry". Separate ministries were formed that exclusively deal with different areas of science and technology. several initiatives were taken by the Council of Scientific and Industrial Research (CSIR) established by the Government of India. The National Institute of Science Communication (NISCOM), previously the Publication and Information Directorate began functioning in 1952 along with the Indian National Science Documentation Centre (INSDOC) in the same year. These two were merged in 2002 to form the National Institute of Science Communication and Information Resources (NISCAIR) with the objective of collection, storage, publication and dissemination of science and technology information through traditional and modern techniques. The NISCAIR also enters into international collaboration with similar bodies in foreign countries to accelerate the process of science communication

and to bring it on par with the state of the art elsewhere. This institution also conducts short term courses in Science Communications. The *Vigyan Pragati*, *Science Reporter* an english monthly and *Science Ki Duniya*, the Urdu quarterly were some of the major accomplishments.

Science communication was an object of special interest in India's sixth five year plan. The year 1982 saw the institution of National Council for Science and Technology (NCSTC) mandated to integrate, coordinate, catalyse and support science communication. Their objectives include training in science and technology communication, development of software and creation of information network and data bases. To meet these purposes interactions through folk media, digital resources, collaboration with non-governmental agencies, civil societies, science cities and museums were also envisaged. National Children's science congress started from 1993 meant for children in the age group of 10-17 years to exhibit their creativeness and innovative talents and projects aimed at solving problems of social relevance through science. Publication of books online, magazines and news letters were also part of the programmes initiated by Vigyan Prasar, an organ of the Department of Science and Technology of the Government of India. VIPRIS makes a compilation of the major scientific news available in the international media. Also the Vigyan Prasar Net Work (VIPNET) functioning since 1998 groups together over 12000 clubs towards scientific outlook and popularization of science activities. The Popular Science Magazine *Dream 2047* in English and Hindi has a subscription of over 50,000. Offices of the NCSTC are housed in 35 states and union territories with access in 18 languages.

The National Institute of Science Technology and Development Studies (NISTADS) was established in 1989 as a fore-runner of the Centre for the Study of Science, Technology and Development founded in 1973. It undertakes research and circulates various contemporary and emerging scenarios including scientific and technological changes. Interaction among scientists, society and state also forms part of its programme. The People's Science Movement (1998) conducted five different processions covering almost 5000 Kilometres in 37 villages staging shows in villages and major Indian cities. Other organizations worth mention are Vigyan Prasar (1989) with *propagation of science popularization*, science clubs etc to encourage scientific outlook and forums like Bharat Gyan Vigyan Samithi and Jan Gignana Vedika in various states of Delhi, Tami Nadu, Tripura etc. The Pondichery Science Forum, the Kerala Sasthra Sahitya Parishad (1962) and the Swadeshi Science Movement (1989) as *an organ of Vigyan Bharati*. They conduct shows, *Street Plays*, stage performances, folk songs and interactive publications to bring awareness among the *commoners of the benefits of science education*. Science Communication has also emerged as an independent discipline of study. Masters

programme is conducted in various universities like Bangalore, Lucknow, Devi Ahalya and Birla Institute of Technology to mention a few, along with Diploma courses in a host of academic institutions and by non-government agencies. Two notable initiatives taken by the Cochin University of Science and Technology in this regard are the Centre of Science in Society established in 1991 and the journal, *Science Communicator*. In the former, programmes for Science talent search among school children and various other development activities are undertaken and the centre has facilities like science park, pavilions, satellite centre etc. The latter is an interdisciplinary journal for science communication and journalism. Both have potential to be at the centre stage of science communication at the national level with proper nourishment. The revisit to the state of Indian Science Communication system made in this article is neither exhaustive nor sufficiently descriptive due to constraints on space and time.

RIO 2016 – A RATIONAL ANALYSIS

Gangan Prathap

Introduction

The story usually told by the mainstream print media is that at the recently concluded Rio 2016, the United States led, if gold medals or total medals are counted; if only gold medals are counted, Great Britain took the second rank but this would change if all medals are taken into account then China takes that spot. But this is a "post-truth" record and is not what will be indicated if a more rational analysis is done.

Bigger countries, by population, or by GDP, or both, can be expected to win more medals than a smaller country. When rationalized for population or GDP, using measures like medals/population or medals/GDP, the picture changes. Such measures are like the extensive properties of a physical system. More precisely, they are like volume V of a lump of homogeneous material. One can now think of this as the simplest (a zeroth-order) measure of size. It was Archimedes' profound insight that weight W was a size-dependent extensive measure linked to an intensive and intrinsic property of the material called density. Thus, density $\bar{n} = W/V$ becomes a size-independent measure. By the inversion of this argument, $W = \bar{n}V$ is a composite indicator that is a product of a size-dependent and a size-independent measure. We can think of W as a first-order measure of size. In this article, we approach the problem of performance evaluation using size-independent indicators and various orders of size-dependent measures to obtain a fairer and more rational assessment.

Size-dependent and size-independent measures of performance

If the number of medals won M is a first-order measure of performance, then population P or Gross Domestic Product GDP are possible zeroth-order measures of size. Therefore, medals per capita or medals per million of population M/P or medals per trillion dollars of GDP, M/GDP are two meaningful size-independent measures of performance at the Olympic Games.

So far, the indicators M/P (medals per million of population) and M/GDP (medals per trillion US dollars of GDP) are intensive size-independent "quality" measures. They are analogous to Archimedes' definition of density. The zeroth-order extensive or quantity measures in each case are P (million of population) and GDP (in trillions of US dollars). This is analogous to Archimedes' definition of volume. The weight

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W follows as a first-order extensive measure of size. Archimedes had no need to go beyond this.

Let us now draw an analogy with moments of area of a two-dimensional plane figure. The zeroth moment of area is total summation of the area, say A . This is analogous to P (millions of population) and GDP (in trillions of US dollars). From this definition, we can proceed to compute what is called the first moment of area – it is the summation of area times distance to an arbitrarily chosen axis. It is a measure of the distribution of the area of a shape in relationship to the axis, and is analogous to M . Archimedes used it to determine the distance from the axis of the centroid of the object. The centroid is at a distance equal to the first-moment of area divided by the zeroth moment of area. This is therefore analogous to M/P or M/GDP . Engineering applications required the introduction of the second moment of area, also known as moment of inertia of plane area, or second area moment. It is a geometrical property of an area which reflects how its points are distributed with regard to the same axis defined earlier. In our performance analysis, the numbers $X(P) = M/P \times M$ and $X(GDP) = M/GDP \times M$ are now analogous to the second moment of area. We shall see how the introduction of these higher-order performance measures changes our understanding of how the participating countries have performed at Rio.

Analysis of performance at Rio 2016

Nearly every media story concluded that the best performer at Rio was the United States - they led the table if gold medals or total medals are counted. This has largely been the case in recent times, at Beijing 2008 and again at London 2012. However, there are a few accounts^{1,2} that used size-independent measures. Then at Beijing 2008, the country with the most medals per capita was The Bahamas¹. This was to change at London 2012². The Bahamas were relegated to third place; Grenada with 11.07 medals per million of population tops this table, ahead of Jamaica at 4.25, followed by The Bahamas at 3.26. India was 85th, among the 85 countries that earned at least one medal, with 0.01 medals per million of population (6 medals for 1.167 billion people). On a medals per trillion US dollars of GDP basis, Grenada was again the best performing nation, with 825.76 medals/GDP in \$trillions, followed again by Jamaica (574.71) and Mongolia (523.18). India was at the 84th place (1.84) followed by Saudi Arabia (1.72) at the 85th place out of the 85 countries that received at least one medal.

At Rio 2016 the number of countries that earned at least one medal was 87 (the Independent Olympic Athletes that managed to get 1 gold and 1 bronze were counted as a single entity). The remaining 119

countries that took part drew a blank. Since it was not possible to assign population or GDP statistics to the Independent Olympic Athletes, the analysis below proceeds with 86 medal winning countries and another 120 that were grouped together as Rest of the World.

We start with P and GDP as primary zeroth-order measures of size. There is only one first-order measure of performance, M . This is the number of medals won, whether gold, or total, or some total score after weighting each colour of medal won separately. This implies that as size-independent measures, we can have M/P or M/GDP . According to these measures, the picture from Rio changes. In Table 1, we see how some selected countries fared. On a medals per million of population basis, Grenada remained the best performing country at Rio. The Bahamas and New Zealand moved up to second and third places respectively while Jamaica dropped to fourth place (compared to London 2012). As in 2012, India was last, i.e. 86th, among the 86 countries that earned at least one medal in 2016, with 0.0015 medals per million of population (2 medals for 1.327 billion people).

It is fairer to assess performance on a GDP basis than on a population basis; richer countries can be expected to dedicate greater resources to sports than poorer nations. Table 2 reports the performance on a nominal GDP basis. Grenada and Jamaica remain at the top two positions; Azerbaijan has now moved up to third place. India remains at the 86th place.

In Tables 1, 2, the indicators M/P (medals per million of population) and M/GDP (medals per trillion US dollars of GDP) are "quality" measures. The quantity measures in each case are P (million of population) and GDP (in trillions of US dollars). The last columns in Tables 3 & 4 are these curious numbers $X(P) = M/P \times M$ and $X(GDP) = M/GDP \times M$. This second-order indicator is a product of a quality and a quantity term and perhaps best represents the "performance" of a country. In this sense, New Zealand and Azerbaijan respectively lead the rankings.

Conclusions

These results are different from the usual rankings that appear in the media. The United States led if gold medals or total medals are counted, for the sixth time in a row in the Summer Olympic Games. If size-independent measures are adopted, Grenada appears at the top. However in the conventional list, Grenada appears at around the 70th place! The second-order indicator which is a product of a quality and a quantity term perhaps best represents the "performance" of a country. In this sense, New Zealand and Azerbaijan respectively lead the rankings.

Table 1
 On a medals per million of population basis, Grenada was the best performing country at Rio 2016.

Classification	Rank	Country	Population 1 July 2016	Total medals	Medals/Million
Top 10 Medal Winning Countries	1	GRENADA	107327	1	9.32
	2	BAHAMAS	392718	2	5.09
	3	NEW ZEALAND	4565185	18	3.94
	4	JAMAICA	2803362	11	3.92
	5	DENMARK	5690750	15	2.64
	6	CROATIA	4225001	10	2.37
	7	SLOVENIA	2069362	4	1.93
	8	AZERBAIJAN	9868447	18	1.82
	9	GEORGIA	3979781	7	1.76
	10	HUNGARY	9821318	15	1.53
	18	GREAT BRITAIN	65111143	67	1.03
	42	RUSSIAN FEDERATION	143439832	56	0.39
	43	UNITED STATES	324118787	121	0.37
	76	CHINA	1382323332	70	0.05
Bottom 10 Medal Winning Countries	77	ALGERIA	40375954	2	0.05
	78	NIGER	20715285	1	0.05
	79	MEXICO	128632004	5	0.04
	80	EGYPT	93383574	3	0.03
	81	MOROCCO	34817065	1	0.03
	82	VIETNAM	94444200	2	0.02
	83	INDONESIA	260581100	3	0.01
	84	PHILIPPINES	102250133	1	0.01
	85	NIGERIA	186987563	1	0.01
	86	INDIA	1326801576	2	0.00

Table 2
On a medals per trillion US dollars basis, Grenada remained the best performing country at Rio 2016.

Classification	Rank	Country	GDP in \$m 2015	Total medals	Medals/\$Trillion
Top 10 Medal Winning Countries	1	GRENADA	1138	1	878.73
	2	JAMAICA	14057	11	782.53
	3	AZERBAIJAN	35141	18	512.22
	4	GEORGIA	13942	7	502.08
	5	DPR KOREA	17396	7	402.39
	6	ARMENIA	10774	4	371.26
	7	BURUNDI	2772	1	360.75
	8	BAHAMAS	8917	2	224.29
	9	SERBIA	37381	8	214.01
	10	UZBEKISTAN	61649	13	210.87
	33	RUSSIAN FEDERATION	1132740	56	49.44
	43	GREAT BRITAIN	2760960	67	24.27
	72	UNITED STATES	18558130	121	6.52
	73	CHINA	11383030	70	6.15
	77	PORTUGAL	205085	1	4.88
	78	MEXICO	1082430	5	4.62
	79	FINLAND	234578	1	4.26
	80	SINGAPORE	294561	1	3.39
	81	PHILIPPINES	310312	1	3.22
	82	INDONESIA	936955	3	3.20
	83	UNITED ARAB EMIRATES	325135	1	3.08
Bottom 10 Medal Winning Countries	84	AUSTRIA	384799	1	2.60
	85	NIGERIA	537966	1	1.86
	86	INDIA	2288720	2	0.87

Table 3
 Rankings using a second-order indicator $X(P)$ based on a medals per million of population basis. New Zealand was the best performing country at Rio.

Classification	Rank	Country	Population in m 1 July 2016	Total medals	Medals/Million	$X(\text{Pop})$
Top 10 Countries	1	NEW ZEALAND	4.57	18	3.94	70.97
	2	GREAT BRITAIN	65.11	67	1.03	68.94
	3	UNITED STATES	324.12	121	0.37	45.17
	4	JAMAICA	2.80	11	3.92	43.16
	5	DENMARK	5.69	15	2.64	39.54
	6	AUSTRALIA	24.31	29	1.19	34.60
	7	AZERBAIJAN	9.87	18	1.82	32.83
	8	FRANCE	64.67	42	0.65	27.28
	9	CROATIA	4.23	10	2.37	23.67
	10	HUNGARY	9.82	15	1.53	22.91
	12	RUSSIAN FEDERATION	143.44	56	0.39	21.86
	34	CHINA	1382.32	70	0.05	3.54
	77	EGYPT	93.38	3	0.03	0.10
	78	DOMINICAN REPUBLIC	10.65	1	0.09	0.09
	79	BURUNDI	11.55	1	0.09	0.09
	80	NIGER	20.72	1	0.05	0.05
	81	VIETNAM	94.44	2	0.02	0.04
	82	INDONESIA	260.58	3	0.01	0.03
	83	MOROCCO	34.82	1	0.03	0.03
	84	PHILIPPINES	102.25	1	0.01	0.01
	85	NIGERIA	186.99	1	0.01	0.01
Bottom 10 Countries	86	INDIA	1326.80	2	0.00	0.00

Table 4
 Rankings using a second-order indicator $X(GDP)$ based on a medals per trillion US dollars of GDP basis. Azerbaijan was the best performing country at Rio.

Classification	Rank	Country	GDP in \$m 2015	Total medals	Medals/\$Trillion	X(GDP)
Top 10 Countries	1	AZERBAIJAN	35141	18	512.22	9220.00
	2	JAMAICA	14057	11	782.53	8607.81
	3	GEORGIA	13942	7	502.08	3514.56
	4	DPR KOREA	17396	7	402.39	2816.74
	5	RUSSIAN FEDERATION	1132740	56	49.44	2768.51
	6	UZBEKISTAN	61649	13	210.87	2741.33
	7	KENYA	64688	13	200.96	2612.54
	8	KAZAKHSTAN	116151	17	146.36	2488.14
	9	CROATIA	49928	10	200.29	2002.88
	10	HUNGARY	117729	15	127.41	1911.17
	14	GREAT BRITAIN	2760960	67	24.27	1625.88
	20	UNITED STATES	18558130	121	6.52	788.93
	28	CHINA	11383030	70	6.15	430.47
Bottom 10 Countries	77	QATAR	170861	1	5.85	5.85
	78	PORTUGAL	205085	1	4.88	4.88
	79	FINLAND	234578	1	4.26	4.26
	80	SINGAPORE	294561	1	3.39	3.39
	81	PHILIPPINES	310312	1	3.22	3.22
	82	UNITED ARAB EMIRATES	325135	1	3.08	3.08
	83	BAHRAIN	1396829	2	1.43	2.86
	84	AUSTRIA	384799	1	2.60	2.60
	85	NIGERIA	537966	1	1.86	1.86
	86	INDIA	2288720	2	0.87	1.75

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EFFECTIVE SCIENCE COMMUNICATION TO ACCELERATE RURAL INNOVATIONS & TECHNOLOGIES FOR SOCIO-ECONOMIC DEVELOPMENT

Ajit Prabhu V.

Introduction

Role of rural technologies in the economic development is well known and recognised world over. In a developing country like India where almost sixty percent of the country's population lives in rural areas, economic development is naturally linked with income generation activities of rural mass. Rural technology is essential for ensuring livelihood and improving living standards of rural masses. Such technologies are also needed to reduce the drudgery of rural population working in the agricultural and small scale industries.

There are basic necessities like health, drinking water, sanitation and hygiene, housing, energy, etc. which demands urgent attention where science and technology intervention is needed. Other pressing issues impeding the rural development are roads, infrastructural facilities, agricultural productivity, communication and other facilities, employment at grass root level etc. These objectives can be successfully fulfilled with the development of effective rural technologies and technological innovations.

Gandhiji who believed that sustainable growth is possible through rural development, said, "India needs production by the masses and not mass production". In his perspective and in the Indian context rural development may be defined as maximising production in agriculture and allied activities in the rural areas including development of rural industries with emphasis on village and cottage industries. It attaches importance to the generation of maximum possible employment opportunities in rural areas, especially for the weaker sections of the community so as to enable them to improve their standard of living. Rural technology has the potential for transforming human life, understanding the abundant human and natural resources in rural areas and to adapt modern technology with the special local condition. Here comes the importance of rural technology development, rural innovations and rural entrepreneurship.

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In this article different types of science communication to rural people (rural communication) are discussed which provide sound platform for exchanging ideas and knowledge among rural people and how effectively innovative events can accelerate the development process. In the article technology development is given emphasis for rural development.

Rural Technology Scenario in India

According to the 2011 census of India, 68.84% of Indians (around 833.1 million people) live in 640,867 different villages. The size of these villages varies considerably. 236,004 Indian villages have a population of fewer than 500, while 3,976 villages have a population of more than 10,000.

Appropriate rural technology focuses mainly on those technologies which are simple and within the reach of the ordinary people for their own benefit and the benefit of their community and harness the local or regional capacity to meet local needs without increasing dependence on external factors. A large number of governments, public and private non-government organizations are involved in developing technologies for rural areas. However, these technologies have hardly touched the lives of the rural population. Apparently, the problem lies not only in the generation, diffusion and adoption of technologies but also in poor communication and documentation.

Most of the technology development that takes place for rural areas is carried out with an aim to keep it simple so that the devices can be made in rural areas itself. Technology dissemination is uneven and slow in the rural areas. Their needs and aspirations are similar to those living in urban areas. Therefore Technology development should take place keeping these aspirations in view by incorporating modern technologies for higher productivity and comfort levels to heighten their standard of living to that of urban.

Many government organizations like Khadi and Village Industries Commission (KVIC), Council for Advancement of People's Action and Rural Technology (CAPART), National Institute of Rural Development (NIRD), Department of Science and Technology (DST), National Research Development Corporation (NRDC), Council of Scientific and Industrial Research (CSIR) and Indian Council of Agricultural Research (ICAR) support the generation and promotion of appropriate technologies under various schemes. In addition, engineering based educational institutions, state government organizations, non-government organizations, voluntary agencies and private establishments augment these efforts. In spite of the advances made, there still remains a big gap to bring prosperity in the lives of the people in the rural areas, perhaps may be because of poor science communication and lack of S&T interfacing to suit their requirements.

Importance of Rural Science Communication

Technological developments in rural areas can only change the livelihood at the grassroot level, empower rural population and contribute to national development. Based on the above background, there is a dire need to shape rural technology into a marketable product with quality standards. Meanwhile the intellectual and other resources from the rural sector need to be harnessed in a proper way for the development of the State and the society. With more Science & Technology (S&T) input and knowledge, the technological challenges can be overcome. That means the technology has to go a long way off from a kind of appropriate technology to the level of the best technological solution, and hence the rural innovators need education, training, incentives, motivation and spirit of innovation.

However, communicating science or technology to the rural masses is still a major challenge in India due to the diversity of languages, localised demand, region specific adaptation, fragmented innovators, poor educational background, lack of ability to use modern ICT tools, local markets, etc. Experts say that science communication has the capacity to create a space from where even a new revolution can take birth. But at the present level the technologies remain like developed from the saying 'Necessity is the mother of invention'. Agriculture and farming based technologies need timely revision and modernisation with higher mechanical advantage and with simplicity of operation, mechanisation and automation, user friendly tools and implements. Diffusion of information and education regarding scientific innovations and progress among rural populace generate interest and awareness and also will lead to further innovations like a chain reaction to ensure the development of rural India.

Mass media has played an important role in disseminating information among the citizens. But due to lack of education and financial incapacity, the people from remote and rural areas are deprived of accessing the television and newspapers properly. Therefore, deficiency of knowledge remains. This dearth of information becomes a hurdle in the path of creating curiosity and the people are compelled to work as usually. But propagation of scientific knowledge among citizens is urgently required today. This article tries to explore the role of alternative ways such as documentary films, arranging participatory communication through agricultural fairs and innovative programmes to recognize and motivate them so that people are provided the opportunity to exchange ideas into reality.

Science Communication through Traditional Media

Traditional media plays a key role in disseminating information about different types of matters among the rural people through their own form of communication style. Some of the publications in Malayalam are

Kerala Karshakan (Monthly) by Farm Information Bureau, *Karshakasree Magazine* by Malayala Manorama, *Kalpadhenu* (Quarterly) by Kerala Agriculture University, *Indian Naliker Journal* by Coconut Development Board, etc. As it is very cost-effective media, therefore arranging a campaign and providing information about that through traditional media simultaneously can enhance the propagation of information. With the support of enjoyable rhythms they generate interest of the people. In the remote villages where television or newspaper has not yet reached, only traditional media can avail there. People have tendency to be acquainted with an unfamiliar thing and to be up to date with an unknown matter with their inherent curiosity. Not only that arranging programmes through traditional media is cost-effective rather than mass medium. People accept entertainment based information a lot.

But it is found that many a time it is not possible to educate rural people on scientific principles and realize about any scientific model which is very large and multi action based. For an example a machine that can perform a lot of work at a time with high productivity, when the same tasks could be done by many people in many days. Similarly the machines which work on various mechanical and electrical and electronics engineering, will appear to be alien to them and may not understand and hence difficult to be adapted. The traditional media cannot show a lot of mechanisms through an entertaining performance. Therefore, the results of any invention would not be satisfactory. Here lies the problem of traditional media. But in case of arranging campaigns for any diseases such as polio, Aids, cancer etc. traditional media will help much because they will perform so lucidly, that people will understand what the symptoms of these diseases are, how they can be cured, what prevention they should take etc. Therefore in case of disseminating information regarding medical science traditional media helps much. This leads to the fact that modern communication techniques need to be applied to educate science and technology to the rural people and to demonstrate the principles.

Documentary films

A pictorial and practical demonstration and presentation of technologies would help the people of grass root level to make out a model of mechanism of any scientific invention. As a mass medium television is expensive. Therefore the documentary films can fulfil the knowledge gap. Being an audio visual medium it has that capacity to provide information and education simultaneously. The performance of a machine, its dynamism, advantages, and effectiveness can be shown through a documentary film. It will be acceptable to them also. Even those people from grassroot level have already done experiments with their machines can share their experiences. As a result, those people who still do not have any idea about that scientific model or mechanisms can easily understand and connect their ideas to the illustrated invention. If the people of grass root level are convinced with the utility of that invention through

using it and watching its activity, then the other people from the same level will accept it immediately and can eventually adapt to the locality and perhaps can lead to further innovations and modifications.

The human insight is described as 83 % through Sight, 11 % through Hearing, 3½ % through Smell, 1½ % through Touch and 1 % through Taste. This explains the importance of seeing and learning. Therefore the people who watch the films can experience the advantages of new machines and also trigger to try it out. Through visualization process the people can understand a model and through audio, they also gather information at the same time. Therefore this documentation works much more effectively towards the dissemination of information procedure. Documentary films have the power to show the entire process right from the working of a machine, say for example a machine for cultivation, cultivation process and all details so that people can understand clearly and easily adopt them. Moreover, most of their doubts will be clarified and can automatically get answers to many unknown areas. Therefore documentary films can outsmart the effectiveness of the traditional media.

Agriculture fairs (Agro Fairs)

It is a practice to organise agriculture fairs by government and non-governmental agencies for bringing together the rural people especially farming community involved in agro-activities. Such agricultural fairs are the best events for providing education and information embracing entertainment. The people of many villages and remote areas gather in such fairs and enjoy very much, observe the scientific invention or models presented, and understand the functions of these inventions which are explained by experts or the inventors. In Kerala, Integrated Rural Development Programme (IRDP) organizes IRDP Fair which is an annual trade fair to promote village traders and self-help groups and rural products. The fair is a platform for beneficiaries of various self-employment schemes of the government to market their products. It also holds exhibition and sales of products including handicrafts, metal crafts, pottery items, readymade and handloom garments, seed and saplings, manure, kitchen equipment, coir products, bamboo products, rural technologies, farm implements and handmade jewellery.



View from an IRDP Fair

In such Fairs, rather than a person simply hearing about a product or technology, he can feel it and see how it performs in the field. Another big advantage of agricultural fairs is that they can exchange, share their ideas with those who have already experienced the inventions. They can ask questions to the experts, interact and instant reply will help them to evaluate the theme. This process will create interest and leads to adoption of such product/technologies and also trigger further innovations over them. The agriculture fair also creates the opportunity where mass communication takes place. The people from grass root level also take participation in the conversation process. Therefore participatory communication helps the people to move forward the curiosity among them. With the help of government organisations it is possible to organise seminars and talks, exhibitions of innovative rural products, fairs for scientific improvements etc. so that the rural people can be provided with necessary S&T inputs attain and can trigger new inventions.

Agricultural Science Congress

In some States, it is found that Government or other agencies organise Agricultural Science Congresses which provides an opportunity for showcasing the scientific achievements in the agricultural field and farming sector. It also provides a platform for all science lovers, scientists, rural inventors, grass root innovators, etc. to come together to share their views on the development and products. The National Academy of Agricultural Sciences (NAAS), India organizes Agricultural Science Congress every year. The Congress will also provide opportunities for the agri-input sector including seed companies, manufacturers of fertilizers, agro-chemicals, pharmaceuticals, farm laboratory & dairy equipment, insurance companies and agriculture related service providers and farm machinery producers to showcase their products and interact with their potential clientele for both generating business and promoting innovation. Some agencies in Kerala organise Children Agri Science Congress (*BalaKrishiSasthra Congress*).



Usually there will be special sessions targeted for children, farmers, agro marketers, science communicators, media, and public in Agri Congresses. Similarly such Congresses organizes exhibitions of various products, technologies, agriculture products, other industrial products, farm produces, and forest products and also provide multifaceted knowledge to the participants. It is a positive movement to organize such science events because it harnesses different sections of people, brings out various products, farm machineries, and other technologies and also prepares a ground for lot of science communication and interaction to happen for technology dissemination and development; which is expected to have long term impact in developing rural technologies in India.

Rural Innovators' Meet (RIM)

Even though, the development of Rural Technology is the back bone of rural development, it has been observed that probably due to the lack of technological support and guidance, and also due to lack of opportunities for interaction with peer groups and experts, most of the products developed are of inferior quality. Also, the grass root innovators are facing many challenges in developing and implementing their innovations. Due to such pressing issues, Kerala State Council for Science, Technology and Environment (KSCSTE) has deliberations with the experts in the field and it was suggested to create a platform for bringing them together to address these issues. Accordingly KSCSTE has designed a special programme called RIM for the science communication with rural innovators and technologists. Rural Innovative Meet (RIM) is a catalytic programme to accelerate wider dissemination and functional exposure to rural innovators and rural technologies. RIM is also a platform to provide necessary S&T input to the innovators and hasten the technology transfer process through participative and collaborative partnership for entrepreneurship development. RIM is a unique programme to provide a platform for the rural innovators for sharing their intellectual capabilities by bringing in new and innovative technologies. RIM is also a programme to promote rural innovators and innovations. It gives an encouragement and enthusiasm for such innovators. An innovator participating in RIM gets a sense of accomplishment when his innovation is recognized. The broad definition of rural technology followed in KSCSTE is such technologies which are developed by rural innovators or the technologies developed for rural applications even by professional technocrats.

Hence, there is need of S&T interventions to upgrade such technologies and to make them perfect for straight adaptation and entrepreneurship. Also, Accordingly, KSCSTE has organized the first programme on experimental basis by the name Rural Innovators Meet at IRTC, Palakkad, from 11-12 February, 2008. The aim of organizing the meet was to provide a platform for the grass root innovators for exhibiting

their technologies and to address the various issues faced by them. Around 30 innovators participated in the event and exhibited their products. Lectures on various S&T aspects and issues faced by them were also handled in the Meet. The Meet was useful for the innovators and from the overwhelming feedback from the participants gave further impetus to us in carrying forward this programme with better perfection.



Scenes from the Innovators Meet (2015)

The Chief Minister presenting Prizes to Winners

Realizing the significance of bringing the grass root innovators to a single platform and giving them an opportunity to exhibit their technologies and provide inputs for them on the areas where they are facing the problems and also for promoting such innovators, KSCSTE decided to organize Rural Innovators' Meet as a continuing programme. The grass root innovators and rural technology developers participated in the event exhibit their products and present their ideas. Moreover, the rural innovators are provided S&T inputs such as lectures on various topics including scientific principles, technology aspects marketing issues for innovators, Adaptation issues, Intellectual Property Rights, Industrial support for Entrepreneurship, etc. during the meet. RIM is found to be an effective programme for communicating science with the rural innovators. RIM provides opportunity for the innovators to present their innovations and ideas among other innovators and public and they feel recognised and appreciated for their efforts. As a token of their efforts to develop rural

technologies, Prizes and Awards are given for encouraging and motivating them. Special Prizes are also reserved for engineering students and professionals who develop technologies for rural applications. RIM also brings out Proceedings which contain the record of all technologies presented/exhibited in it. Hence, RIM provides appropriate forum for the rural innovators for exchange of ideas, present technologies, facilitate necessary S&T input, take away lot of knowledge and trigger further interactions and development of new technologies. With several specialities, RIM remains as a unique inspirational programme for science communication among rural innovators.

Conclusion

Science Communication to rural people, also called rural communication is an interactive process in which information, knowledge and skills, relevant for development are exchanged between farmers, extension/advisory services, information providers and researchers either personally or through media such as radio, print and more recently the new Information and Communication Technologies (ICTs). In this article some more recent trends and innovative communication events are brought out. The aim is to put rural people be innovators, intermediaries and receivers of information and knowledge in a position to have the necessary information for informed decision-making and the relevant skills to improve their livelihoods. Also, a novel programme (RIM) instituted by government of Kerala (through KSCSTE) is also presented. Such approaches of communication for development rural people, rural innovators, rural workers, planners, development workers, local authorities, farmers and all stakeholders are brought together for better people's participation and community mobilization, decision-making and action, confidence building, for raising awareness, sharing knowledge and changing attitudes, behaviour and lifestyles; for improving learning and training and rapidly spreading information; to assist with programme planning and formulation; to foster the support of technology development and other support systems.

IMPACT OF BRAIN SCIENCES ON ORGANIZATIONAL MANAGEMENT

A. P. Jayaraman

A CEO gets up, leaves his cabin and briefly greets five of his Directors and briskly returns to his desk. Soon after, the five greeted Directors, in turn, meet their General Managers and a chain reaction rolls on down the line of command. This is a behavior in the exercise of free will. Can we expect to know the implications of brain sciences for workplace behavior? Can we apply that knowledge to produce designed and intended effects?

Free Will

Is free will as free as it is thought to be? Most of us believe and love to believe that we have a free will and so we are the conscious captains of our destiny ship. But if it were possible to use brain scans to predict our every action—showing that our choices are determined before we actually make them—would we jettison this belief?

Neuroscientists argue that our sense of free will is nothing more than accidental collocations and the workings of a massive assembly of nerve cells. This leads to determinism; the idea that every effect is connected by physical laws in a causal chain. This is why the behavior of a physical system can be predicted and the brain is not exempt. If determinism is true, the future is set—and this includes all our future states of mind and our subsequent behavior.

It all starts with a thought. Thinking is a cerebral activity. C-suite executives have happily subjected themselves to neuroscientific experiments and have shown keen interest in applying brain-based theories to their own success and to that of the organizations they lead. Today big B-schools boldly brandish their brain sciences courses including neuroleadership projects.

Insight into Behavior

But deep down we have doubts. Knowledge, as Bertrand Russell said famously, begins with doubt. If we define knowledge as belief in agreement with facts, we are in for a problem. No one knows for certain

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what a belief is or for that matter what a fact is. More problematic is the nature of the agreement between the two. Begin with belief. Belief is a state of mind. Behaviorists call it a characteristic of bodily behavior. Our CEO got up from his seat and went on a greeting spree. A thought or belief is displayed by a behavior. Yet behavior can be the same whether we have an explicit belief or not. When we are out of doors and a shower of rain comes, we merrily put up our umbrellas if we have them. Some may articulate them. Others act without explicit thought. Result is the same. We and donkeys both go out of the sun into the shade under a tree. We have an explicit belief as the cause of our behavior. But the shade seeking donkeys lack this. Such is the causal mechanism of human behavior. Is there an opportunity for growing awareness about the collective brain of an organization as a valuable asset from the understanding of individual brains?

Organizational Cognitive Neuroscience

Neuroscience studies nervous system. Advances in molecular biology, electrophysiology, and computational neuroscience have laid strong foundations of modern neuroscience. Cognitive neuroscience asks questions about psychological functions and neural circuitry. Sophisticated measurement techniques such as neuroimaging, electrophysiology, and genetic analysis have added new dimensions. Skillfully designed experiments in cognitive psychology allow neuroscientists to address abstract questions of cognition and emotion mapping specific neural substrates.

Thus a brave new branch of management sciences is emerging. The admiration and love affair between brain sciences and organizational behavior are maturing into a matrimonial alliance. Organizational Neuroscience (ON) is a burgeoning research domain that integrates organizational behavior with neuroscience. ON triggers a scholarly dialogue that explores the implications of brain sciences for workplace behavior. It is also called Organizational Cognitive Neuroscience (OCN). In the 1980s, there was an intellectual endeavor to integrate neuroscience with social psychology. Hopefully meta-theoretical questions raised by neurosciences will bring new insights that will force management scientists to rethink their concepts of essential human nature.

ON received a great fillip with the Human Brain Project which started on 1 October 2013. This is a huge ten-year scientific research project that aims to build a collaborative ICT-based scientific research infrastructure to allow researchers across the globe to advance knowledge in the fields of neurosciences, computing, and brain-related medicine.

Paradigm shifts are luminously obvious in neurosciences dictated by novel experimental designs and Big empirical data analytics. The core

competence stems from neuroimaging. Identification of neural substrates and their functioning as they relate to social-cognitive phenomena in organizational context are in focus yielding significant insights. New light is being shed into cerebral activity.

Potent Novel Tools

Powerful technological tools are in active laboratory use analyzing brain activity. Neuroscientists employ direct measures of brain activity using such methods as functional magnetic resonance imaging, electroencephalography, magnetoencephalography and positron emission tomography. These tools open a new level of analysis to organizational researchers and hold the promise of addressing and answering new and good questions. Old fuzzy discourses and long standing bitterly divergent debates are converging hopefully to a Grand Unified Theory. However operation of these tools, design of experiments and interpretation of data require higher order skills in multiple disciplines. Although data mining is time consuming and expensive, nuggets of knowledge-strategic information- are being gathered.

Neuroscientific Leadership

The baffling diversity and agility of thinking demand rethinking of business leadership. Can we deconstruct deeply embedded leadership patterns and create new mindset? Will we be able to use wearable technology and biometric data to personalize leadership development? Can we change our immunity to change? Can leaders be transmuted and, in turn, can organization be transformed? Will applied neuroscience unleash brain power? These are good and valid questions to ask in management sciences. Brain usage patterns provide biological basis of human behavior with insights into brain-body-mind nexus. Neuroscience may be applied to various topical areas in organizational behavior research at both individual and team levels.

Today organizations are asking for different skillsets from their leaders. Leadership advertisements carry words and phrases such as *innovative; agile; able to deal with uncertainty and complexity; ability to manage change; collaborative leadership style; mentor to team members; ability to communicate at all levels*. Leaders are caught in the vice of increasing stress. They are required to do things they did not sign up for. Many wish to be followers. Quitting is common with instability and demotivation down the line of command. Neuroscience helps us to understand that the stress of leadership can lead to brain fatigue and burnout. Decision-making quality declines with less time. Leaders become disconnected from organizational strategy and direction. Performance declines as proactivity gives way to reactivity.

Neuromarketing

Neuromarketing is estimated to be a two billion dollar industry globally. It studies the response to products and consumer decision-making

on the level of body and mind. This might involve looking at how familiar brand logos engage the memory systems in the brain, or examining whether the direction of eye gaze of people in ads affects how attention-grabbing they are, or testing whether the brain's electrical activity varies when watching subtly different ads.

Neuroscientists now know that we process purchasing decisions and emotions in the same area of the brain. This means that the same area that evaluates numbers and specs before a car purchase, for example, is at the same time processing our need for social approval and status. In essence, it is in our biological makeup that our wants are inter-twined and embedded in our rationality. Our choices, however informed and researched, are fueled by subconscious emotional desires. Neuro marketing can provide insight to planners. Neuroscience permits us to know which specific segment of the commercial worked and which word sparked the effective excitement.

Neuroscience enables us to know that our pleasure-centres take great control of us. We make decisions because we want to, more than because we should. A celebrated neuro-marketing case study is the Pepsi Challenge. Based on taste alone, Pepsi should own half the market share, but Coke is more popular because of the experiences and associations people have with Coke.

The implications of neuroscience for Organizational Management are sharply divided. Proponents argue that a new neuroscience of organizations will revolutionize understanding of a wide range of key processes leading to better organizational management practices. Contrarians decry the relevance of neuroscience primarily on philosophical and ethical grounds. The golden mean is an intermediate, critical realist position keeping the toolkits of proven People, Process, and Performance packet honing it with neuroscience research findings.

Thirty six years ago, management used to be defined as 'getting things done through people.' Presently the definition has expanded as 'working with and through other people to accomplish the objectives of both the organization and its members.' The increased emphasis on the human element can be better appreciated through the advances in brain sciences.

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