JAIN UNIVERSITY

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RESEARCH RETREAT

Summary of Presentations in Plenary Sessions

Jain University organized its Annual Research Retreat for its Doctoral Students on 31 January and 1 February 2015. This Reportcontains the summary of presentations by Eminent Speakers at thePlenary Sessions.

The Summary has been prepared by the Research Guides and Scholars who attended and participated in the Retreat.

Summary of Presentations in Plenary Sessions

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CHAPTER I

INSPIRING EXCERPTS OF THE INAUGURAL SESSION

Dr. Sandeep Shastri
Pro Vice-Chancellor, Jain University, Bangalore

When the inaugural lamp of the Retreat was lit, all the other lights went off. The lighting of the lamp - which symbolizes the light of research, the light of knowledge and the light of awakening, overpowered the other lights indicating the knowledge, power and capacity that is present in this retreat.

Dr. C.G. Krishnadas Nair
Chancellor, Jain University, Bangalore

During programmes like the research retreat, conferences, symposium, workshops and the like, interaction between scholars and supervisors happen in a unique way. Many great ideas may be generated in these interactions. Such novel ideas are to be analyzed, accepted and used in its true spirit. Scholars have come up with excellent topics. While working on those topics, we have to consider and follow the ethical aspects of research. There are several journals today which allow for easy and quick publication. Let us not be carried away by the number of publications. Let us look for those journals where publishing in the same would give both the author and the university valuable recognition. It is also critical that we give importance to the `IPR` dimension of our inventions and innovations. While publishing articles about novel inventions, it is advised to patent them as it will bring accolades to the researcher as well as the university.

Research that is linked to innovation has a commercial potential, it needs to be patented so that the innovator gets due recognition. We need to ensure that the limited resources at our disposal generate the best possible output. Experience has shown that in some domains, it may be useful to try and build your own equipment and apparatus to use during the process of research. Creating apparatus will develop a lot of confidence in the scholars. If we are able to do that, we can design the equipment for our research on our own.

Researchers have to keep their minds open to the world about what is happening around, so that one can possibly avoid the risk of replication. We can replicate those which are important and high in utility using cost minimizing and feasible strategies. Hence, in order to avoid unfair replication, it is important to have a good focus during the literature survey. While publishing papers, try to take advice from the Universities' patent department to understand the patentability of what we publish. Excellence has no finishing point.

Dr.Chenraj Roychand
President, Jain University, Bangalore

Just the other day, Dr.Venkatesh, our Dean of Research, introduced me to a person who works in the area of renewable energy and how it can benefit the society and economy. His ideas were a clear indicator of how the countries economic development depended on innovation and could be sustained by a strong knowledge base. He spoke of the reuse of the newspapers we read every day. We all go for marriage ceremonies where food is served on plantain leaves. These leaves are

placed on clean white paper sheets. Think about the amount of deforestation, the amount of national resources that is wasted. This person connects all these used news paper to a reel which can be laid on the table. Through this, the cost comes to a mere twenty percent. He was neither a scientist nor was he registered for a formal research degree but he came out with an innovation that had the potential to make a significant contribution to society

Renewable economy is important to the economic development of the country. It is the need of the hour and part of a knowledge based economy. Prof. Mukunda, one of our aerospace scientists came out with a novel idea on power. We are now facilitating the implementation of that idea. Innovation is a critical dimension of research.

Now we are facing a revolution through the idea of the internet. Without string theory, there can be no internet in this world. Technology based models developed by scholars can bring new methods to enhance productivity. For all this, the power of thinking is the base. It is the idea of the scholars that is going to change the society. The only question is; can we make our life meaningful, using our power to think and innovate?

CHAPTER II

INTERDISCIPLINARY RESEARCH

Dr. B.N. Suresh
President, INAE

There is today a lot of confusion in terms of what constitutes basic research and applied research. Talking of individuals like myself, we have all worked in the area of applied research and contributed in the process to society. Basic research often involves developing new knowledge. If we really go back in history, many said basic research had contributed to several developments that had changed the way we live in the society. It is important to underscore the fact that the knowledge generated by basic research needs to be leveraged for the advantage of society. It could either be in the form of a device or it could be a policy initiative or it could be a value addition.

For its success, research also requires the right ambience. In the medical field, it is not only the doctors who bring revolutionary changes. If one does not have an excellent administration in hospitals, doctors would not be in a position to now make the contribution that they do. There are many examples where numerous lives have been lost only on account of the inefficiency of the administration. So, excellent administration policies will definitely make a difference in the hospital.

This country has had endless discussions on education and all its ramifications. Most people tell us that the country has still miles to go before we achieve what the developed world has achieved. One important reform that the Indian system of education urgently requires in a need to focus away from teaching

and concentrate more on learning / practicing. We must fix our focus on learning. It is not important to complete the syllabus and prepare our students to write the examinations. It is more critical that we prepare them to learn all those skills and internalize all that knowledge which is useful for life and living.

We face several challenges on account of lack of infrastructure. It is noticed that less interest is given to infrastructure. This happens not on account of our not having the knowhow or capacity. It is simply because of poor design and faulty management.

Consider Bangalore as a case. There is haphazard traffic in this metropolis. If you do a little bit research on how it could be improved, one can notice that there are several simple solutions that can make a big difference. Even if we are able to save, through a new finding, five minutes every day in our travel to the workplace, it will make a huge difference. Applying our research findings can make a tremendous difference.

Advanced technologies can help us a lot. The bottom line of all inventions is multi-disciplinary applicability. If you think that I am the specialist in a particular area and I would make a difference, then you are mistaken. You have to necessarily interface with many other people. When we look at the society and the challenges it faces, there needs to be a collective will, collective effort and pooling together of talent to be able to overcome the same. At the end of the day what is critical it what solution leads to the improvement of the society.

Our public policy process needs to have inputs from all segments of society and every field of research. We have today problems in the area of land management and sustainability o\f agriculture. Management researchers cannot think that their research has nothing to do with these issues. Look at the problem of water scarcity. For the last two decades, the ground water is depleting. If we continue in this manner, how do we meet the water needs of the future? We cannot be worried about the challenge only when it blows up in our face. We have to look at solutions and alternatives today, to pave the way for the next generation to survive. We are prone to natural disasters, such as landslides, draught, cyclones and the like. Have we worked on practical and feasible solutions to these problems?

While talking about cyclones, it is noticed that any successful attempt at mitigating the challenges produced by a cyclone requires the combined efforts of those involved in science & technology, space, administration and government - the entire gamut of the processes, to save millions and millions of lives. Deforestation brings in its wake so many negative consequences that multi-disciplinary research needs to focus on meeting and mitigating the challenge. Nature and society are very complex and it is extremely difficult to understand both. Our country with over a billion people have the potential to work towards solutions. The results then would be significant and outstanding.

The climate change, we used to talk of ever so often has important interdisciplinary ramifications. To study the impact of climate change on rivers and

oceans people from different field are involved today. Geologists, Oceanographers, Fluid mechanics researchers, industrialists (discussing about the pollutions), atmospheric scientists, meteorologists, and solar radiation scientists are all involved in dealing with the challenges of climate change. All these subsystems that the different researchers are tracking are linked to time and space. Needs keep changing with the times. Hence, time is an essential factor. It also spans natural and social sciences. It can contribute to policy making. To make it fruitful, the research culture needs to be developed in the school itself. Children ask a lot of questions. That means they have an inquisitive mind. But it appears as if our education system successfully destroys that inquisitive mind. When will they start asking questions? When they listen to something and an idea comes to their mind, they will start asking questions.

One young boy is taking his grandmother through a village. They have a long way to walk. While walking in the darkness through narrow pathways, the light of the torch can be seen only by the person who goes in front. The boy made a difference by structuring a light at the back side of the torch. Similar is the case of a pen with pressure sensor created by a boy to be alert when he got drowsy. Here, the mind to generate ideas is very important. So what is our duty? Our duty is to find out how our domain area is interlinked with that of other. In the first place, we have to define the problem. Then go for the interdisciplinary aspects associated with the problem.

For effective inputs for policy making we need to collect data from wherever available. Then we have to put it all together and create the policy. A good incubator will cost now around One and a half lakh rupees. There are many who cannot afford the treatment costs if there is a premature baby. To solve this problem, students in IIT-Mumbai recently created an incubator using the water heater, hot sensors and the like. They tested it in the laboratory and this sample costs only four thousand rupees. Nurturing and nourishing such simple ideas in an interdisciplinary way of inquiry can contribution to the wellbeing, welfare and betterment society.

Combining one discipline with another is complex. It is often better to work in a team of interdisciplinary studies. Inter-disciplinary interactions can make the enquiry easier and meaningful. However, it will work smoothly only if there is a proper mechanism in the administration to bring together diverse groups, a very good review system and right panel member for interdisciplinary research. There has to be a common aim, common language and frame work so that the team effort will produce results which will be socially useful and beneficial.

Clear targets need to be set. Targets have to be weekly, monthly and/or annually depending on the complexity of the problem. Further, a good monitoring system has to be there to check if everything is working as per plan and anticipation. It is not the experience of the member, but the commitment and cohesion along with the expertise that helps the multidisciplinary tasks to succeed.

CHAPTER III

RESEARCH DEVELOPMENT AND INNOVATION: NATURE AND SCOPE

Dr. R. Natarajan
Former Chairman, AICTE

Being a developing society one of the major challenges that India faces is that its young minds go to the West for their doctoral research and when they return home, they do not have access to equivalent and sophisticated facilities and laboratories that they had earlier worked in. Similar is the case of the scholars who do their Ph.D. in IITs. For instance, facilities are lacking in rural areas and semi-urban areas of India. As a result, scholars today prefer to return to the places where they were trained so that, the intellectual excitement does not diminish over time.

Let me narrate a story. A gentleman went out to a saint in search of knowledge. The saint took him to a river and pushed him into the water. After a few minutes, he was gasping for breath. Finally the saint helped him come up and then asked him; "You had an urge to clasp your life when you were gasping under water, hadn't you? Do you have the same intensity in your urge to acquire knowledge? If yes, I will help you attain it. There is an important message for researchers here.

Doctoral scholars may face the challenge of underestimation of expected results not only by others but often by themselves. The best method to overcome this dilemma is to meet the supervisor at regular intervals, report the progress of the research and receive the Guides valuable comments. However, the supervisors may be busy with their own projects and there may be occasions when opportunity

for face to face contact will be limited. The scholars have to find some methods to maintain contacts with the supervisor. The supervisor is supposed to supervise, to mentor, to appraise the scholar. Therefore scholars should not loose contact with the supervisor

Choosing the institution with proper facilities, proper intellectual environment is important. If there is a feeling of isolation, at any point of time, the scholars may feel the urge to give up. In IITs, students used to go for extra coaching classes. It will provide the scholars an environment to interact. Interaction between the research scholars within a department is also important. Research scholars have to talk to each other. Interaction will enhance the social support system and will reinforce confidence and can be an add-on for success. Research is not carried out in an ivory tower, but it is an interactive process. That is why there are seminars and conferences, in which scholars share their philosophy and findings with other scholars and thereby receives valuable and at times critical feedback.

Doctorate is not about research for its own sake, but is undertaken in order to demonstrate that the scholar is a fully professional researcher. Will it help a person to teach better? Is it important to have a Ph.D. qualification in order to teach higher education? Knowledge flows down a potential radiant. As in the flow of energy there is flux loss … so too in the flow of knowledge. The potential of information provided after practicing research will be powerful to overcome this flux loss.

Selection of a good research topic is a challenging process. To come up with a good research, an exhaustive and comprehensive review of literature will immensely help. Reviewing the literature may be extended up to one year or more. Along with the identification of the problem, details of what is to be done should also be identified and then half of the problem is solved. Comparison of experimental and theoretical research is interesting. Experimental research is dependent on the availability of equipments and instrumentation. Experimental research depends on the skill set of the technicians too. Further, it is time consuming and the work place may also be congested and noisy.

India started moving in the research direction only in the 1970s. For promotion, "publish a research work, or perish" was the policy during that time, in the engineering area. In 1980s, it became "publish and consult, or perish". Just publishing a paper was not sufficient for an engineer. The expertise must be utilized in a positive way. Later it became "patent and publish, prosper". Now, we have an open source revolution, "Publish and share."

Research is an evolutionary process. First of all, concentrate on publishing the paper, no matter where it is. Get in to the habit of disseminating the information you think is valuable. In the second stage, look at the quality. Publish in well regarded journals and present in well-respected conferences. We can go for journals with high impact factor or those in the SCOPUS index. What is impact factor? After publishing a paper in a journal, somebody may follow it, as a part of the literature survey. The person who followed it and made it a part of his or her study's literature

will cite it. The more the citations of the papers in a journal, the higher will be the impact factor.

Citations will be higher in the first three years after the publication. This period is called impact factor window. It is difficult to interpret the impact factor and it is not right to compare the impact factor of different journals. Engineering journals will not have much impact factor as Pure Science journals. Science journals will have more readers than engineering journals, as the latter is more specialized in a particular area.

Punjab University is ranked up above the IITs in the world ranking because two professors from Punjab University participated in a large hydrant collider project at Geneva. How many authors are there in each paper…? Typically 40! So, no need of waiting for the individual contributions to the scientific world. R & D is not an individual, collaboration can make a difference. Within your institution how many of your departments talk to each other and join hands for interdisciplinary research? This century is clearly the age for interdisciplinary research.

CHAPTER IV

ROLE OF RESEARCH IN MAKING A GREAT SOCIETY

Mr. T V Mohandas Pai
Chariman, Manipal Global Education

Throughout history, human civilization has been led by new thoughts. Ideas tend to dominate in any part of the world. In ancient India, our great thinkers and philosophers tried to find out the reason for our existence. The most important questions humanity has ever been faced throughout history is, "Why are we born?", "What is the purpose of life?", "And if we are going to die, why should we labour?", "Why did great kings and emperors build great Kingdoms and Empires?", "Why should we strive?"

Throughout life, people work to achieve something which is very ephemeral, even if there is an expiry date. What is the meaning of this?!

The questions are so challenging because there are no right answer to them. Thinkers during that period debated among themselves and tried to come out with their views. Nevertheless, the quantum of sheer thought that is prevalent in ancient India was unbelievable in terms of its depth. Now most of us are disconnected from our past on account of various reasons.

We were taken away from our own past what is rich in thinking and in philosophy. There was a great tradition and this tradition is not just *Mumbo-Jumbo*, it has a logic and followed mathematical calculations. There was a development of mathematics, not in the way we understand it right now. It all happened in a period of time which we can call civilized - the backbone of any

civilization is research and science and it happened in India much before anywhere else. Socrates and Plato have been famous for starting Schools of logic, their tradition became the foundation of Western Civilization and their thoughts on logic, philosophy, creation, and human existence still dominate western philosophy.

Ramanujam wrote his famous note books in which he came to conclusion by deduction and still his methods of deduction are not fully understood. Can we call it as intuition or is it some kind of miraculous understanding of the theoretical backup of Indian tradition. It might be on the basis of the same theory, Ramanujan proved Hardy, the number of the car as lucky number. Intuition can be said to be a large part of Asian critical thought. Intuition which I mention here is something which can be instilled by observation, by learning and the flash of brilliance in the mind, when all the synapses in the neurons acts together and send a message and finally we end up with the "eureka feeling". It is an output of the mental processing capacity.

Electrochemical potentials in the neurons can be active even during sleep. According to Manjul Bhargava, the problems which could not be solved and kept in the mind before sleep would come out with solutions when we wake up. During sleep, people will be thinking and the result may be an intuitive output. Such intuitions are the backup of many of the Indic philosophies. The same is the case behind the Ancient Greek, Chinese, Mesopotamian civilizations. They all respected learning and identified those great ideas from philosophers to improve the quality of life of the people. Findings and inventions were inspired by these philosophies.

Later, thoughts and intuitions emerged as a result of the motivation received from the philosophers. Great civilizations always revered their scholar, when Genghis Khan came and conquered the entire world in 12-13th century, the first thing he did after settling down and annihilating many civilization was to summon all the scholars and to discuss how to make his capital better. He thought that he would be remembered not for his brutality and killing but, for bringing up a civilization with a lot of importance especially for learning.

Ideas during a period are the powerful instruments to define the society. India was never a unitary state, when British left us we were 545 states and we united it into the Republic of India. Before getting united, we were a group speaking multiple languages, having different ways of life and culture, but there was something which held us together and it was a civilization that prevailed all over this subcontinent previously. In the freedom movement, in response to colonial domination, people from multiple facets from the right, from the left, from the centre, from the lords, from the tenants alike, grouped together and worked for a single aim. That mass movement led us to freedom and to develop a Constituent Assembly. And also, we adopted a constitution which explained how the people in the country live peacefully. The Idea of India was defined in a single book of the constitution. The idea rules our life even today.

Ideas come based on learning, research and discovery. It can permeate the human existence and can bring changes in civilization. Buddha, after enlightenment, came out with the Nirvana principle. Buddhist thought, which

emerged 2600 years ago, grew up through Sangha in the entire expanse of Asia, including Middle Asia, Eastern Asia, India and South-East Asia. It was a thought and power of liberalization, in the sense - it liberated the human souls from the bondage of conventionality. While bringing out the idea, Buddha did not know the impact. For centuries it worked and brought revolution in human thought and it even shaped new civilizations. Similarly, ideas of liberal science, liberal arts and ideas in many other facets of human existence came out of the thinkers.

Modern science & technology started after the Reformation and Renaissance, which led to the flowering of free thoughts across much of Europe during St. Peter's time (1600). Other parts of the world were in a stupor, as importance was more for the Kingdoms than for the scholars. There was nothing in South and North of America; India was in the hands of Kings and Traders and in China, the period of Ming Dynasty. People from Europe during the time, came with the new tradition of seeking proof, the evidence based science. Till then, the prominence was for the observation based science. The theory of Charles Darwin, which was partly evidence based and partly deduction based, even challenged the theory of creation and became an important theory of biological science.

If we think about great societies in the modern era, the first one which naturally comes to mind will be Germany. Germany was the dominant economic power in Europe in the mid 19th century after its unification by Bismarck. They created an industrial empire on the basis of science and technology, France lead by Napoleon and then Great Britain which was trying to build colonies and where two

major universities Oxford and Cambridge became the core of much of the knowledge and discoveries. And the wars between 1914 and 1918 and the wars between 1940 and 1945 redefined the search of knowledge and more investment was done in science.

In the present era, scientific status assumed new dimensions with the rise of United States. U.S. became the dominant economy in the world in 1910 overtaking Great Britain. During the war, much of the scientific power came from the European countries to the U.S and U.S was building the Post-War University System. Hitler rose to create an industrial empire at the time of World War II, even though Hitler was notorious for killing Jews and the initiator of the Second World War, he invested time and money for a system of discoveries. The use of rockets V-1 and V-2 in the war were developed in 1945 by Germany.

When the war ended, Werner Von Braun and over 100 key V-2 personnel were taken away by U.S. Before that, due to the persecution of the Jews, many including Albert Einstein migrated before the wars and found refuge in America. Hence, the real study of modern society starts with the end of the war. Oxford and Cambridge were unable to spend much money for academics and research but, American Universities flourished. Thus, America started creating the best post war society and they dominated the entire 20th century as no power has dominated elsewhere. A lot of great discoveries happened in America because of this collection of the talented.

In most countries, science and technology grows with the investment in defence. When people fight wars, they fight for the survival, for that there has to be armaments and weapons designed by the own people. During the closing dates of the war (1942 to 1946), Operation Manhattan, a research development project that produced the first atomic bomb during World War II, was led by U.S., under Oppenheimer. It was then used to stop the war after dropping the bomb on Hiroshima and Nagasaki. That created a base on which America grew. America was the first post war society which then nurtured so many inventions, so much of discovery and all this made them dominate for the next three to four decades, and despite what happened to their economy.

To create a great society there needs to be some basic building blocks

1. The university system
2. The industrial system
3. Free open society and a culture in which everything and everyone is openly questioned
4. Public funding for all the other three building blocks.

These four building blocks make the society capable of research through which active members of the society could envisage the creation of a great country. The first building block is "university system". Universities have two purposes – the creation of knowledge and dissemination of knowledge. Dissemination happens while delivering lectures and teaching. Creation is a concomitant of dissemination and to disseminate the knowledge, the knowledge has to be current. The learners

will be fresh curious men and women who seek the latest created or found out truths. The university is an open system of intellectual curiosity, where great Professors come together and participate in the creation and dissemination of knowledge. Here we can see a closed loop because, the creation requires dissemination and dissemination requires creation. The purpose of the university is the fulfillment of human curiosity. A system is yet to be developed in India where the great universities are autonomous and where great Professors can invest time to create and disseminate knowledge.

Coming to the second block, whatever discoveries are made by the researchers in universities leads to be the industrial goods as well as industrial services. Here comes the connection between industry and academia, for instance, when Stanford University was started, it was an ordinary university founded by Leland Stanford, a railroad magnate, U.S. senator and former California Governor, together with his wife Jane Lathrop Stanford in memory of their only child Leland Stanford, Jr., who died in 1884 just before his 16th birthday.

Whatever may be the story, the founding grant of Endowment from Stanford was issued in 1885 and the university was officially opened on October 1, 1891 with 555 students. It was in the Wild West, down in the dark place called California but, they created the culture. After the war, the electrical department started making components; semi-conductor department came up and started creating electronic chips, circuits, transistor and the like. In the last five decades, the place witnessed the greatest discoveries of the post war world. All this happened because academia worked together with industry. Oxford and

Cambridge took time to transfer their findings to industry. In Stanford, there was a quick transmission because the faculty went and participated in business, many of the students took the knowledge from their professors and started their own companies. That became what is called Silicon Valley.

Considering India, we have Hindustan Aeronautics, ISRO, DRDO and many other R&D organizations. We are investing a lot of money in science but, our scientific establishments have not worked with universities or industries. Whatever they discover is not permeated into the open system due to various reasons. When Ronald Reagan became the President of America, he spoke about the Star War. American were apprehensive because, Russians had invested a lot of money in technology and if Russia could send a missile, America will be left without a shield. Reagan and his associates thought about creating a star war programme by creating a shield around the United States. Using radars and missiles they realized the shield vision and it happened as a result of industry-university collaboration. Many of such discoveries which we use today to enhance the quality of life happened during the time of the war and were made for defence.

The third pillar is the open system of democracy. Can free thinking, free discovery, thrive in a closed system? An example for the closed system is Soviet Union. Indeed, it worked up to a particular limit. China is also trying a closed system and they are also making it work. A closed system has limits in creating a free flow of thoughts and ideas in such a way to help the entire society to grow. An

open system enables the free flow of thoughts and hence the innovations and discoveries, which would ultimately have the ends in the wellness of humanity. Indic tradition was an open system which always encouraged enquiry and questioning. It is the same open system that helped U.S. to be at the top among the nations for the past half century.

The fourth pillar is public funding. Public funding is necessary, because research is essentially the discovery of new things and the benefits of the discovery go to the public. For example, Jonas Salk came out with the invention of Medicine for polio. It was not patented by the inventor. Benefits of discovering the medicine is now enjoyed by entire humanity. As per ancient Indic tradition, knowledge has to be free. Once it was given free, people question it, assimilate it. Public funding has to be a part of the creation as the advantages out of it is for the public. In private universities, teachers have to spend most of the time in teaching as fees is a major source of maintaining the capital. If public fund can come through research, the research capabilities of the faculty can be used for the benefits of the public.

Both fundamental research and applied research have to be encouraged. When Marconi founded wireless system, it was a fundamental type of research. But even years after it is used and became the inspiration of modern finding of the mobile phone, which became the largest billion device of the world. Six billion devices have been sold, when there are only seven billion people in the planet. Everybody is connected with this small device, removing the barriers and creating

an egalitarian system. Hence, time and money have to be allotted to fundamental research.

The challenges of a great society, despite scientific advancement and research, have always been "how to remain human?" At the end of the day, are we becoming widgets? Are we controlled by others? A human being at the end of the day is a bundle of emotions. We are a chemical reaction. Our experience of pain and pleasure is internally, just electrical impulses. Externally, the pain and pleasure are experienced through our relationship with people. But, the advancement of science and technology may make us simply widgets. Hence it is equally important to encourage liberal arts, which would help human beings to be humane rather than machine dependents. Liberal arts and humanities will enable us to be human beings with full of blood and emotions.

Still we wonder with no solution to the question what our forefather asked 4000 to 5000 years ago – 'What is the purpose of life? What is the meaning of existence?' After 4000 years of evolution and science & technology and discovery, we come back to the same question! At present the world lacks good philosophers. Any nation cannot be great banking only on science and technology. There has to be a balance and it has to be maintained through Arts, Humanities and Literature. Citizens in a great society should be able to enjoy aesthetics, poetry, stories, beauty and the like. Diversity enables a system to be healthy in its existence.

Research and creation of knowledge is essential. To encourage research, university systems have to promote higher standards. In the universities, the search

of knowledge has to be the credo. Technological innovation has made dissemination too liberal as anybody can Google and find out the latest information. Hence, the method of teaching has to be transformed into problem solving processes. Better mentor, guide and direct the students toward information instead of delivering it in the classroom.

CHAPTER V

MY JOURNEY AS A RESEARCHER

Dr. G.K.Karanth
National Fellow, ICSSR

In the very beginning of my doctoral research, I can found myself doing research without knowing the norms of research for a degree. More than that, when I was even younger, I want to be a medical doctor, and because I couldn't be a medical doctor, I thought, somehow I should get hold of this doctor before my name! And so, I decided to register for a doctoral research programme.

Prior to this, of course, I had done reasonably well in the university. As a student at the Masters level, I was thoroughly disliked by my teachers. Once I completed my post-graduation, I decided I must look for a job. In those days, colleges used to have recruitment committees, in which a representative of the university would be there. I was not selected by the recruitment committee (because in all someone who taught me would be there) and because of that, I thoroughly disliked my HOD. I walked back to my house in tears after one interview on not being selected and then I decided, let me do research.

That stage was essentially important to me because, I jumped into a large pool, without knowing. I got into a doctoral research programme with the legendry Professor, M.N.Srinivas. During those days, I was not sophisticated as, I think, I am now, but in those days, there had been signs of it. He saw me talking somewhere in a seminar, and it may be because of my way of speech or my language or whatever, he told Professor Parthasarathy, "Partha, who was that guy who was saying

nonsense in that seminar? I think he can be my doctoral student". Parthasarathy told me this several years later. That is how I landed doing doctoral research. I will share my first failure.

"Karanth, decide on what you like to work upon, and get back to me." This was Prof M.N.Srinivas' first advice to me. Even though, still selection was not over, and the fellowship had not yet been awarded, he knew that I was going to work with him. "Go, think about a topic and come back!" In those days, there was no Google, no Wikipedia, and no quick information sources! Where will I go to get the information about what to do?

At this juncture, I'd like to give you a glimpse of the last chapter of this narration. Today we have information in abundance. The problem is no longer with the availability of information….there may be a problem in managing this information. While doing research, it is not getting the information, but the capability of handling the information I receive, that is critical

Going back to the flashback, it was a period when information was apparently not abundant and easily available. After consuming half a packet of cigarettes and after a three kilometer long walk by the side of the tank, the temple yard, I kept thinking what topic… and finally landed with a flash of a topic. It was a strange coincidence. I was reading "The Hindu" and saw a book review, of Studies in Agrarian Social Structure. I must say, I was very very happy. Why don't I do

some research on this topic? I did it like selecting unique apparel after a long process of search. It sounds funny and interesting when I think about it now!

Now, we can go through multiple alternative topics, with the help of internet data bases, and can finally tie a knot. Before tying the knot, however, we have to think about the pros and cons. I remember, people asking me, "Do you think if I do a research on this topic, it will have a good scope? Or will it be a good job? Those days, for me, I did not think of it. But now, we have tremendous opportunity to think of all these dimensions. The only thing which we have to do is to enhance our capabilities in handling the information we receive. Capabilities of creating an opportunity are in the hands of the researcher.

Going back to the past, at the end of my entire search, I wrote about seven and a half pages on long paper (not the A4 size, in those days A4 was not there) by hand. Then, with great delight, I went to Dr.Srinivas, and said; "Sir, I'm done!" He just looked at me, and probed: "What, precisely, is the meaning of 'I'm done'? Does it mean that you were "undone" all these days? He looked at the material and asked "Do you expect me to read this?" "Yeah, I guess" I said. In those days I've thought him to be very arrogant and pompous, but now I see, why he said all that. Every subsequent time I gave something written to him, he used to tell me; "Karanth, please keep triple space not double space!" So that, he could fill his comments in between! He would fill the paper with his corrections and finally, he would say "Karanth, I'm short of space!".

And he read the material I gave. Then, for about two weeks, I kept trying to see him. He kept saying whenever we met, "I need to recover! I need to recover!" When we write something, we'll become so enamored by our writing that we won't even have a second look at it. We are so impressed with the content we have written: "I have written so much! And will get excited with it and will say "I'm done with it" and will not go back to it.

My supervisor asked me: "Will you turn back and look at the mirror?" We will do it all the time. But, when we write something, we'll never look back. That is when I discovered, what I had written - my first proposal, was (if you don't mind my foul language…!), "crap" (I'm sorry if you are expecting some other word!).

He told me "No! This is not the way to write". Forget about the subject matter. He taught me, now, grammar, and I had to relearn my English, and then I realized that I have to write it differently. In the end, I discovered that my Masters degree did not enable me for a Ph.D. Instead, it enabled me for a qualification.

For those who are beginning their research, my advice is, think a lot to confirm what to work on. A Ph.D. thesis is not about bathroom singing! There, whatever you sing is okay and even if you suddenly forget the words, you will increase the speed of the shower, and its noise will cover up your errors. And then, you can pick up again and continue singing and nobody will listen to you. Any research is not a shower! It is something which you have to do a little more carefully.

How did I overcome my limitations and my shortcomings? Still, I am not sure if I have mastered it. The simplest way of narrating how to overcome those limitations is, 'try to keep your eyes open, look at various topics and see whether you can make a contribution. I am not talking about the contribution that may earn you a Nobel Prize or some such awards. Come up with something that people, generally, will not think about or know much about. Or can you reinvent something which is high in utility.

When I walked through the library of a research institution, in the doctoral theses section, I found "Integrated Rural Development in India: A case study in Madhugiri Taluk, Tumkur District"; not even Karnataka! If I am going to do the replication of different pieces here and there, I do not think that research can advance. Of course, a scholar will not realize this at the initial stage of their research. The major dilemma for a scholar in the beginning will be to find a guide. Whether that guide has guided enough to misguide you is another question, but finding the guide is the primary concern. And then, the registration and the deadline for registration! And unless the application is submitted on time, whether you will get your fellowship or not! Thus, you start up with a half-way, piece-meal approach to your Ph.D. thesis!

When I finally registered. My supervisor told me: "I'd like you to come up with the bibliography of what you have to read". In between, we had some two-three sessions, unfortunately, always at three o clock, when he was not at his best of thinking and I certainly was not, because my ticket for a matinee show was in the pocket and the show time was fast approaching! He used to give me excellent

lectures as well as we would have good discussions. Obviously, unless you read sufficiently enough, those lectures and discussions would not make any sense to you.

He would say, "Karanth, Bertenstein has said some stupid thing in one of his recent papers. I would like you to have a look at it and come back for a discussion with me." He cannot, definitely, first teach me what all things Bertenstein said and then asks me what all things are stupid in it and then highlight those things and then take the discussion forward. "Have you read Bertenstein Karanth?" 'No sir! Who is this guy, sir?' - I did not ask, but it was there on my face. "Bertenstein Karanth, don't you know? Go and take a look at *such and such* journal". "Okay sir! I'll see sir". I did go take a look at Bertenstein. As I started reading, I felt the ideas were perfect nonsense! I understood that it was because of the depth of my ignorance. After reading, I went to meet my Guide and talk about it. So the best thing is to talk nonsense as I did not understand anything. "Yes sir, very beautifully argued sir!" "Tell me what he is trying to argue" Then I've to make some stupid things. So I said: "Sir, about the change in Feudalism sir…" "Good…! Now you tell me, how we should look at it in the background of Indian agrarian social structure…." It went on.

Today, it sounds so interesting because I have sufficient knowledge to, at least, pretend I don't know anything about it. But in those days, I have to pretend I know everything, but it did not make sense.

Hence, scholars as beginners should begin with reading things. At the initial stage there is a mindset, when I go through a book or a journal article, I will look

for the title of my research rather than whatever research is there and whether or not it has any relationship with my research or something I have never looked for. To make it some more specific, do not expect literature to be ready made for a scholar. Literature is out there! You have to make sense out of it. You make sense out of it, not in the way your supervisor wants it, or as the general public wants it, but in a way that you can make further sense out of it. May be, in such a manner that you read to find further things about it. It is not as 'go, finish and come back'.

Review of literature should be done in such a way that you make sense of every dimension of it. Let us say, I went with a piece of work. At the conclusion of that work, you ask me; 'who carried out this work?' My aim was to find out what that work was about, its content, objectives and how it was concluded and the like. We were not bothered to look at: where was it carried out? Thus, when you undertake review of literature, have a template in your mind, in such a manner the word search could be made in every way it is possible. And your memory has to be in such a way, if a question comes, you can readily answer it. Scholars, who were aware of the process of reviewing, would begin to train their mind for this accordingly.

Going back to review of literature or bibliography, I did in such a way that the standards of those days helped. But, later when I went to the London School of Economics and met Bertenstein face to face, I realized that I knew nothing more than what I discussed with Dr.Srinivas that day. When I told him about it he said: "Didn't you notice my repeat paper in which I completely managed to overcome my shortcomings? I remember, it was Srinivas who had pointed out that it was

nonsense, and he even wrote to me saying that I made a stupid analysis". I was shocked at the correspondence that they had!

What am I trying to say here is, like you read daily news, you have to constantly keep updating what you have read as your sources of information. You have to make sure that your references at the commencement of your project are in fact the same as that at the conclusion of your research. You should not commit the error of outdated reporting. Such errors may make us emotionally upset!

You know, in research we will get wedded and obsessed with the different stages rather than mastering the content of each stage. At every stage of research, there is a corresponding expectation of outcome. Hence, at the end of one year after my registration as a Ph.D. scholar, people started asking me: 'when will you complete your research?' So, for after a month or so, field work will become an obsession. Dr Srinivas, one day asked me, "Where will you do for field work? In your proposal, you have mentioned as Karnataka"

Paradoxically, external dimensions became more important than the practicality of doing the research. Here, I would like to mention that external factors may compel you to compromise on some areas of your project. These compromises are operational requirements and the scholar will have a tendency to forgo the academic requirements of the project. Proposals, on the contrary will contain very good promises. Proposals will be structured concentrating more on the grants than on the practical dimensions. Compromising our academic rigor while

we start operating through the project thus is a common phenomenon, which should not happen.

I started to look at the practical difficulties of going for my field work. And I went out through the field, without even a clear picture about it - whether I have to go there with a questionnaire, or will it be an interview schedule or some other tools… And it was very recently, when I shifted from my old house to a new one, those tools of my doctoral research were junked (can I use that word?!). In those days, there was no photocopying. I have to take copies using a cyclostyling machine. Why I had to junk it? Because, I did not use it! Why?

I prepared a questionnaire, based on the literature I had read and the academic discussions we had in coffee rooms and shops, which did not contain questions fit to the field. For instance; 'Will you belong to a lower class, upper class, upper upper class, upper lower class….?' So, there were nine categories classification of classes! First day of my field work, they expressed their lack of knowledge of the language through which I tried to communicate. So, I had to translate it into the regional language and when I showed more keenness in doing research, the subject became suspicious whether it is to report to the authority…! Finally, I realized that the two and a half page cyclostyled material was waste. That was why, when I showed my supervisor the questionnaire before I went to the field, he said in a very lethargic way, "Try it, and let us see!"

Search here, needs to be translated from you sources of information to field, where you want to carry it out. I had to translate it in the manner that would be relevant. I had to, then redo my research tool. Something what looks insignificant in

the theory becomes most important in the tool. One of the quickest lessons learnt was 'be ready to change your approach.' Nobody is there to hold a gun and shoot you for changing your approach. If it is necessary to make an adaptation with the need of the time of what we have presented in the proposal, we should be open to do it but, don't forget to justify when you change. But let it not due to the operational reasons which can be called as personal.

In short, the title of my doctoral research when I submitted my proposal has to be changed during the culmination stages of my work. . What I wrote in the thesis it had nothing to do with my original title. During the submission of the thesis, this change of title became a challenge. The title of the work I was submitting had been "Change and Continuity in Agrarian Relations". The original title was "Changing Agrarian Relations in Karnataka". University said 'No! You cannot submit.' I went back to my original title. In front page of the thesis, when we open with a dedication. Here, I wrote, "Readers may find it strange. The thesis is titled *Changing Agrarian Relations*, but the content is actually *Change and Continuity in Agrarian Relations*." Again, to submit this, with such a "Forward", I showed it to our Vice Chancellor, who was then Mr. K.R.Narayanan, who later became the President of India. Noticing it, he was shocked, "Do you plan to submit this?" He asked. "I have no choice sir" I said, "because if somebody reads the content of my thesis, it will be rejected, due to the mismatched title." "Why did it happen?" He queried. I explained to him the lesson I learnt while doing the research: "Sir, when I started my research, I have read this material about change. But when I went to the field, I found using the term change is conceptually wrong. Change is actually a continuum, and not a break from the past. Therefore, I had to change the title".

At the time of my submission of thesis my Guide was Professor Oommen. When I used the term 'continuum', immediately he asked, "You are Oommen's student, aren't you?" "Yes!" I said. He dialed Dr. Bipin Chandra, the Dean and said, "Dr.Bipin Chandra, there is a complication. I will send this Karanth there. I think we have to discuss this issue"

Dr.Bipin Chandra was full of happiness over this page. He was completely in agreement with me. "I liked the spirit in which you've written this." Consequently, I got the permission to change the title. It was a major change in Jawaharlal Nehru University, which started giving permission to revise the title after this incident.

During the process of research, people may ask you what your topic is. When you explain the topic, they would ask, "What is your theoretical framework?" Second question, will be about your conceptual framework. And the last question, if you are not dead already with the first two, will be about your analytical frame work. These are the three frameworks that a scholar is ashamed to admit that he or she doesn't know. I have realized that there is nothing wrong in admitting that we don't know, if we don't know. I would admire a research student or a doctoral scholar who would come and tell me or tell someone else: "Look! I am working with such and such a thing and I am unable to figure out how I could have a meaningful conceptual framework or a concise analytical framework or a distinct theoretical framework." Imagine that you have already formulated your research and there are key terms in it. These terms will have multiple meanings. Multiple implications will be there along with the meanings. And for each of those meanings and implications,

there are a range of things said about by others. This range of things are called theoretical framework. It is not something that comes readily. Out of what is available, the scholar will develop a framework of theory, of concepts and of analysis. The scholar will determine the meaning for them, for the frame work of the scholar's enquiry. A researcher who has developed the framework need not pretend knowledge.

To conclude, the journey of research is a constant play on your conceptual framework, theoretical framework and your analytical framework. These frameworks will change from one research to other. Frameworks are developed on the basis of available information. The researcher has to have the capability of handling the information and managing it for the formulation of the different fame works

CHAPTER VI

ENGINEERING RESEARCH METHODOLOGY

Dr. Sham Chetty
Director, NAL

Research in the Domain of Engineering and Technology encompasses a range of specific niche specialization areas and is carried out at Universities, specialized Research Institutions and Government and Private Research Laboratories. The focus today is clearly on going beyond ones discipline boundaries and undertaking inter-disciplinary research. The emphasis is also on innovation, social utility and practical application. Technology, as the name itself suggests involves a premium on creativity, innovation, applicability and compatibility.

It is critical that the `culture of research` today be developed across educational and other academic institutions. This would entail prioritizing research as part of our under graduate and post graduate syllabus in engineering courses. It would also require `Research Methodology` being introduced as a formal course in the syllabus in all degree programmes across all Universities in the country. It also needs to be discussed innovatively focusing on `hands-on` learning.

Research in the domain of Engineering invariably involves `mixed` methodologies. The factors that contribute to a researcher deciding the right mix of methods, is determined by the objectives and scope of the study, the nature of facilities available and the time frame within which the study must be conducted. While all research needs to have strong theoretical foundations it also needs to focus

on application. Often researchers focus on qualitative studies and contribute significantly to theory building. Quantitative studies often are more application oriented.

As doctoral scholars when commencing on your research journey it is important that we have clarity on what is the focus of our work and what are the critical research questions we wish to focus on. Over time, an absence of a clear focus and direction could result in a researcher losing interest and enthusiasm in pursuing the research work. When one is involved in a research project, it is important that a researcher is clear about his/her role in the project and the time of responsibilities they would shoulder and the research access they would enjoy. It is useful to clarify the extent and level of acknowledgement one would receive when involved in a research project. Research work often involves collective endeavors and it always useful to clarify ones role in the very beginning.

Research work today is about being able to sustain oneself in the `long haul`. A critical element in being able to sustain the effort is the ethical norms that a researcher steadfastly adheres to. There are `short cuts` to `instant success` which some adopt that result in `long term` disastrous consequences. A researcher needs to constantly and conscientiously be watchful and guard against deviation from accepted norms. Very often researchers have claimed that deviations occurred without their knowledge and in `good faith`. Either way, a researcher would need to take responsibility for the same and it always useful to always be watchful of the

steps one takes. It is also important to underscore the fact that the `ignorance of norms` is no excuse for not following the norms.

Research often is a collaborative process. As a researcher be a part of the `Research Network`, exchange ideas with peers, participate in conferences and seminars and contribute to both knowledge sharing and knowledge garnering. Deliberating with others constantly provides new insights and reassures one that they are on the right path. It also gives one an advantage of a second opinion on matters that they are undertaking research.

As doctoral researchers you work under the Guidance of a supervisor. It is important that ones builds a healthy rapport with the supervisor and constantly consults him/her on the progress of your work. Given the supervisors past experience and expertise, their guidance is of critical value to a researcher. Their insights often help the researcher stay focused and on track.

It is important that a researcher publish in journals of academic repute. Publishing in Scopus Indexed Journals or Copernicus Indexed Journals is important as it would give credibility to your work and permit it to reach a wider and the appropriate research audience. In the long run, the credibility of the journal in which your papers are accepted for publication is a testimony to the quality of your research work.

CHAPTER VII

INTERDISCIPLINARY NATURE OF SCIENCE

Dr. Mahadevan
Professor, Indian Institute of Science

Dr. Mahadevan's talk focused on the interdisciplinary nature of research today and the importance of ethics in research.

A physicist turned geneticist himself, he explained how the boundaries between subjects are dissolving, giving rise to more complex and interdisciplinary research, unlike the classical trend of domain specific research. He stated that a comprehensive background of various disciplines is now imperative, in order to facilitate quality research output. As an example to his audience, he elucidated how research in biological streams is no longer confined to single areas but entails the inputs from physics, chemistry, mathematics, computer science and statistics. The monumental discovery of the structure of our genetic material, DNA, itself was the result of the collaborative research between a biologist (James Watson) and a physicist (Francis Crick), commemorated by the award of the Nobel Prize and hence, laying the foundation for modern biology.

A major part of his talk concentrated on the significance of ethics in research. He laid emphasis on the fact that, "Science is based on trust" – is an unspoken code which is unfortunately highly neglected. Any violation of this trust is hence a transgression on behalf of researchers. There is a substantial amount of trust that is

placed on researchers and their findings and therefore, the tolerance of any misconduct on their part should be questionable. It is the responsibility of researchers to ensure that the quality of their research is reliable and reproducible, without plagiarism or falsification of data. Credit must be given if and wherever credit is due.

Having been the editor of a reputed journal and receiving many articles for publication, he shared with us the value of ethics in publishing and authorship. He stressed that in India, there is a lack of awareness and regulations regarding ethics in research. He suggested the need for the establishment of ethics-regulating bodies at the institutional and government levels, in order to highlight the stringency and transparency of ethics in research, strongly backed by the judicial system of our country. These bodies would allow researchers to stand up and fight for their rights without any prejudice or bias, guaranteeing better quality of research and progress in science and society.

CHAPTER VIII

THE CHANGING BUSINESS AND TALENT SCENARIO

Dr. Selvan D
Sr. Vice President, CapGemini

The address started with a crisp question from the speaker. He asked the audience, "What are your expectations from this session?" There were several responses to this question from the audience. One of the research scholars asked, "Sir, how can academicians gain access to corporates and professionals from the industry for collaboration?" Another scholar asked, "What are skills necessary for the academicians to be accepted by the industry?" Further, there were questions about difference in perception of academic research in the west and in India, the need for collaboration between industry and academics, the objectives of good research work and so on. When questioned about the unenthusiastic approach of the industry in India, towards the research scholars in management, the speaker stressed on the fact that research scholars and academicians have to become "useful to the industry" and should talk 'the language' of the industry in order to be accepted by the industry. He also mentioned some instances in his research work that asserted this point.

He went on to establish the need of staying updated and relevant by using a video-ad: A Day Made of Glass 2: Same Day. Expanded Corning Vision (Link: https://www.youtube.com/watch?v=jZkHpNnXLB0) by Corning. The audience expressed their opinions on the video. He stressed on the fact that we had to stretch

our limits of imagination to new heights and how imagination could lead to meaningful questions and quest for understanding new things. He also said that the 'lifespan' of products and services has decreased, fuelling the need for disruptive innovation.

He spoke of Gartner's technology hype cycle to explain this phenomenon. He emphasized on the fact that all technologies go through this cycle and companies use this to build frameworks of design and marketing of their products and services.

He also brought an important point relating to social relevance of research. He said research has to be socially relevant and should contribute towards solving the issues being faced by the society. He opined that research work done purely for academic credentials and theoretical documentation may not have any major impact towards improving quality of life. He also spoke about the need for in-depth understanding of processes and systems relating to the chosen area of research. Then, the session was opened for discussion and questions. During the interaction, the issue of research funding was also discussed. The speaker expressed his views on this subject and said that corporates would only selectively support or fund research if it served their business interest and said that the primary goal of any business would be generating revenues and making profits. The onus of proving the utility of the research would lie on the researcher. The need for management faculty to continually interact with businesses, help in incubation and funding of small business, documentation of business changes and challenges was clearly brought out during the interaction. In conclusion, the presenter underlined the message of quality of research and consistent efforts towards improving ourselves in the chosen domain.