

Creativity and Innovation in Research: Scope for Multidisciplinary Research

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Abstract

This paper discusses something about research in general and multidisciplinary research in particular, the context being a Post Graduate Course in Commerce or Management. Improvements in the development of the three 'master' skills of creativity, critical thinking and influence are essential for developing the next generation of researchers. Their future careers are set against a backdrop of economic turbulence, an increasing demand for capabilities in these skills in the private sector, a growing requirement to demonstrate impact beyond publications with their research and a career trajectory that is unpredictable and short-term. In the research-process, some focus on process, some on philosophies. We must also develop best practices in doing research and continue with them until we get a new idea to put into practice. Multidisciplinary research is definitely a buzzword of our time; it regularly decorates the pages of funding proposals and applications, scientific reports, and our professional language. However, after the applications are sent, funding is provided, and papers are published, how do we know that the work was actually multidisciplinary, or even close to it? Time to ponder!

Keywords

Creativity, Disciplines, Innovation, Knowledge, Multidisciplinary Research

1. Introduction¹

"We must no longer wait for tomorrow - it has to be invented" (Gaston Berger)

"Tomorrow is not what it used to be!" (Paul Valery)

While research activities in academic and advanced learning centres are expanding, many researchers continue to grope in the dark for want of disciplined and directed approach. Their objectives, methodology, findings as well as their implications and applications are so much challenged as to fall on the side of scepticism. That is not good research process, participation and product. Often research suffers from rigidity despite rigour. Singularity becomes a bane. Research becomes weak not only in terms of structure and substance but also in terms of impact. In this era of globalisation and collaboration, researcher and research

process can ill-afford to be aloof from multiple and diverse inputs and impact. Research, especially in economic, commerce and management needs to have a wider canvas and audience akin to capital widening and market expansion. In fact, it is the pre-requisite of cohesion and integration. To ensure this creativity and critical thinking must be cultivated and developed. An interdisciplinary approach with the necessary best qualities and practices in research can make research meaningful and useful to all.² The objectives of this

¹ This is a revised version of a paper with the same title presented at the Research Methodology Workshop, MBA Dept., University College, Mangaluru, Karnataka State, INDIA, February 9-12, 2015.

² Explaining the difference between interdisciplinary and multidisciplinary research is important. Multidisciplinary research is bringing disciplines together to talk about issues from each of their perspectives. They may collaborate, but they maintain a separation of their disciplines in that process. When the project is done, those disciplines go back to where they came from to start other projects. Interdisciplinary is bringing those same folks together in the same way, but using that expertise to create new instruments, models, approaches that couldn't occur if they were separately handled. So you're creating new knowledge by say, integrating sociology and anthropology or economic science and management science and we create, let's say, this protocol that addresses the issues from both and integrates them, I'm developing a new way of trying to find new answers," and that's the difference. Interdisciplinary is bringing those same folks together in the same way, but using that expertise to create new instruments, models, approaches that couldn't occur if they were separately handled. See for details, Resnick, Jacqueline (2012).

paper are therefore

- to discuss the nature and scope of multidisciplinary research in general;
- to understand the relevance of creativity and innovation in research; and
- to know how MDR could be facilitated

The study is based on secondary data collected from diverse literature available in journals, books and reports and information gathered from the interactive sessions held with researchers and research supervisors at various levels.

2. Nature of Multidisciplinary Research

2.1. Understanding Research

Research is inquiry for truth or solution to a problem. Research is journey of exploration – going beyond the obvious or personal experience/feelings/opinions in search of an idea / cause/solution. The American Marketing Association (AMA) defines marketing research as "the process or set of processes that links the consumers, customers, and end-users to the marketer through information – information used to identify and define marketing opportunities and problems; generate, refine, and evaluate marketing actions; monitor marketing performance; and improve understanding of marketing as a process." Research is an integrated process of

- Problematisation
- Methodology
- Instrumentation
- Sampling
- Data Collection
- Data Processing
- Research Reporting

Problematisation: This is also referred to as "formulating the research problem". It is said that a problem well defined is half-solved. A business economist/manager must translate the management problem into a research problem. Examples: (i) How much bonus is to be given to factory workers? (Management problem); Research study on productivity to be conducted for bonus determination (Research problem). (ii) Whether to set up a shopping mall in a city? (Management problem); conduct an exploratory research to determine viability of the proposed shopping mall (research problem). A problem could be overt (apparent) or covert (latent) or an unnoticed opportunity. The researcher must select that problem which gives the maximum net value research. She must make a clear statement or definition of the problem specifying – (a) sample (b) time and space boundaries, (c) product features and consumer preferences, (d) specific environmental conditions. Add here explanation of the process!

Methodology: This part tells us the ways in which data will be collected and analysed. Three main methodological groups are qualitative, quantitative, and mixed (multi-method). Mixed method jells well with multidisciplinary

approach.

Instrumentation: Several different research instruments i.e. tools to collect data, can be used to achieve the same research objectives, viz. Aggregate Data Analysis, Case Studies, Content analysis, Document Analysis, Ethnography, Evaluation Research, Human Factor Analysis, Interviews., Observations, Organisational Analysis, Policy Analysis, Sample Surveys, Social Impact Analysis, Questionnaire, and so on. The choice of the instrument is based on operationalisation and strategy for data collection.

Sampling and Data Collection: Sampling is the process of choosing a representative portion of the entire population – an integral part of research methodology – involves selecting a group of people, events, behaviours or other elements with which to conduct a study. Example: The population of PG students in a college is 600, only 200 PG students are included as the target population, and only 100 students are chosen as samples for the actual study. Sampling methods are classified as either probability or non-probability. Data can be collected with any tools from two types of sources – primary and secondary. Primary data gives you first hand observation/investigation. It includes statistical data, historical data, works of art etc. Secondary data involves examination of studies conducted by other researchers. This includes books, periodicals (e.g. textbooks, journals, newspapers, and films), reports etc.

Data Analysis: Data are facts that have not been interpreted whereas information is analysed fact which has been subjected to interpretation and hence useful to decision-makers. In order to convert data into information, data analysis is necessary. The step of analysing data is important because, analysis assigns meaning to the data. A wide variety of techniques can be applied to convert data into meaningful information. Some of the techniques are – Spearman Correlation Coefficient, Pearson Correlation Coefficient, Simple Regression Analysis, and Multiple Regression Analysis.

Research Reporting: - This step refers to communication of the results of the research to a wider audience – evaluators, policymakers and other researchers. One of the greatest risks of failure in marketing research comes from poor communication of findings. Research reporting is a test of – (i) how well the research was conducted and (ii) how well the research audience was understood by the researcher. Research findings can be reported orally or in a written form – dissertation, thesis etc.

2.2. The Concept of Multidisciplinary Research

At this point, it is good to refer to the definition of our buzzword, though before jumping into that, it is first useful to know what the term *discipline* means. According to Janssen and Goldsworthy (1996)³ a discipline has a close institutional

³ W. Janssen and P. Goldsworthy (1996), Multidisciplinary Research for Natural Resource Management: Conceptual and Practical Implications, Agricultural Systems 51, 259-279.

order, has its own professional standards, publication outlets, and education programs. It also gives a scientist an identity, in which the principle of scientific reduction is a central attribute. This means that each discipline is expressed through a certain set of norms and values, which are constructed on the basis of the field specific reduction and the underlying assumptions of the reality. Scientific reductionism is the idea of reducing complex interactions and entities to the sum of their constituent parts, in order to make them easier to study. Slowly and steadily, therefore, the quantum of the 'unknown' becomes less.

Multidisciplinary study or research refers to combining several specialised branches of learning or fields of expertise. This more broad approach to scientific research has developed from the need to answer complex questions, which a single discipline is unable to handle, such as in natural resource management for example. Going into defining multidisciplinary research leads us to knowledge associated with several academic disciplines. In practice, multidisciplinary teams are composed of individuals coming from various disciplines. This means that they may not share the initial set of norms and values, and a time-consuming task of developing new norms for the team must take place. This task requires skills and flexibility both from leaders and team members. As Janssen and Goldsworthy opine, solid foundation for building the new norms is a problem-solving orientation of the team and a clear shared-goal.

2.3. Forms of Multidisciplinary Research

- *Additive*: Research group is formed by various disciplines working independently. Yet mutual respect between disciplines occurs, there is no interaction between the disciplines, and the group does not put effort into synthesizing their results. Independent results may be included in a collective final report.
- *Non-disciplinary*: A specific discipline is not able to answer the study subject, thus approaches borrowed from several disciplines are used.
- *Integrated*: Many disciplines take part into the study, and a synthesis of disciplinary results is developed. There is mutual respect among disciplines; however, collaboration only occurs where necessary.
- *Synthetic*: Here interaction between disciplines develops so deep, that it leads to a synthesis in a new discipline. The new discipline will have its own principles and assumptions. For example, when economics is integrated with business to form business economics, it can take advantage of the principle of value (economics) but also of the principle of value-addition (business). A business manager can do so from his skills in business and/or financial modelling. Taking cue from engineering perspectives we can say that a synthetic research always accommodates questions like, "what next?" anything better?" Both the spur of questions and the answers can emanate from sequencing of issues or classified data or in simple modelling from information storage. Synthesising

creates an almost fine and final step for holistic study.

2.4. An Illustration

For the sake of better understanding let us consider a research topic, "RESEARCH IN ECONOMICS AND COMMERCE – FERTILITY FROM FUSION?"

The premise is that –

- Economics (Theoretical + Empirical = Applied) and Commerce & Management = Managerial Economics
- Economists: Mainstream Economist, Social economist, Managerial Economist
- Managerial Economist/Manager/Entrepreneur: Business Manager, Social Entrepreneur/Social Capitalist
- Capital: Physical, Financial, Social, Intellectual etc.
- Slot: Total organisation
- Perspective: Total Quality Management

This premise helps us build the new paradigm, i.e. integrated research

- Research: inquiry, activity (e.g. marketing, sales promotion): optimal wealth creation and sharing
- Gives more knowledge (advanced knowledge): like Stephen Spielberg planning a movie that takes place in 2054 when technology has advanced to the point where crimes can be detected before they are committed. Such a new paradigm could be derived under the following conditions: a) combine economics and commerce into a new field (e.g., business economics), b) combine research of economics and research of commerce into an integrated research (e.g., business economics research) that can c) combine quantitative and qualitative research traditions into one domain and field (e.g., integrated business economics research).
- Deep search: trying to understand the visible and invisible: what is before and behind the market (market minus and market plus) – the win-win situations
- Goals and the Process: What about expectations before conceived experiences? Are not these things having impact on present tactics and futuristic strategies and options? ⁴ Amidst new concepts, constructs and practices such as ubiquitous commerce (u-commerce): combination of traditional e-commerce and wireless, television, voice etc., we see a fertile (meeting) ground for researchers from the two fields.

Thus, in integrated research, all the stakeholders concerned should recognise that, "*it's not just about you and me, it's about us*". Our knowledge and research practices must enable intensification of any given educational programme. An open environment in the academic institutions for intensive interdisciplinary research and knowledge sharing can create a win-win situation for the stakeholders. Researchers must move from independence to interdependence and beyond the comfortable parameters and boundaries of their distinctively different but complementarily organised academics. Contrary

⁴ Like Stephen Spielberg planning a movie that takes place in 2054 when technology has advanced to the point where crimes can be detected before they are committed.

to literary reference, in this context, fences don't make good neighbours. While upholding one's own view a researcher must also accept the nature of other paradigm (perspective). Knowledge of research and of its findings ultimately is a product of the researcher's paradigmatic approach to this 'multifaceted' phenomenon. Therefore, there is simply no economics research or commerce research. The pursuit of knowledge is as much ethical, moral, social, economic/commercial, ideological, and political activity, as it is a technical one.⁵ Research and research findings should not be confined to be memory analytics. The data warehouse and business intelligence should become game changers not only in commerce but also in the whole economic life of the society. Then not only the theorists and researchers but also other stakeholders will stand to gain from the induced good performance in expanded domains of research.

3. Critical Evaluation of Multidisciplinary Approach

3.1. Advantages of Multidisciplinary Research

Engaging in multidisciplinary research has a number of definite advantages:

- 1) Your specific approach and knowledge may be standard for your discipline but novel in other fields. Applying your knowledge in this new field can give you a leading advantage and a unique angle to solving outstanding problems.
- 2) Multidisciplinary research helps avoid beaten tracks. For instance, one can design a new methodology for the research problem. This is essential because methodological approach itself keeps evolving with changing intellectual, functional, technological and other perspectives of knowledge and investigation. Gathering of information will then not side-line the analysing mechanism even it one such has to be (re)designed.
- 3) Monodisciplinary fields can become very crowded with specialists and the number of distinct topics to be studied is limited. Often a certain school or professor produces a number of postgraduates who wish to establish themselves in a scientific career. They cannot all keep doing exactly the same things in the same field.
- 4) By teaming up with complementary research groups, one can combine the collective expertise and gain synergy. This results in increased chances in original (high-impact) research and potential to get more output with less work.
- 5) When everything out there – communication, marketing, governance etc. (example, the Internet) – has become multidimensional, a similar breakthrough in research philosophy and practice is not uncalled for.

⁵ To state the obvious, no informative research, however, can be devoid of the influence of incentives and institutions, at some point or the other.

3.2. Limits of Multidisciplinary Research

As a researcher with MDR approach, one needs to know one's limits

- *Spectrum*: Do not go to spread out your research activities too thin.
- *Resources*: A significant investment in people and equipment is necessary, as all aspects have to be covered with a variety of equipment.
- *Independent or interdependent*: Do you want to do this and do you have the resources? Rather than becoming a multidisciplinary group by yourself, it may be much easier to team up with other specialists with complementary skills.
- *Collaboration*: How is the 'alliance' – strong? Are there egos or conflicts? For a multidisciplinary project to work collaboration has to be found which is capable to deliver results without being too painful. This is a task easier said than done. A common mistake is to seek out people with the same expertise as yourself, which is natural as these are members of the community you are familiar with. The challenge is to find complementary expertise outside of your comfort zone and team up with individuals who you feel comfortable to work with.
- *Fund and approvals*: Is the 'MDR' permitted by your organisation? Many research-funding organisations still follow traditional models and it might be difficult to get them to support work, which combines different disciplines. Often they point their finger to each other saying that the project better fits with the other organisation, as nobody has the complete expertise required to assess the proposal. The same holds for reviewers of the project who often are older members of the 'core' disciplines who not always appreciate the novelty offered in cross-disciplinary projects. Overall, it is not always easy to get multidisciplinary projects funded in traditional schemes.⁶
- *Expertise*: Is the research team ready with training, communication, flexibility operations?
- *Getting published*: Some don't publish, some will. There are specialised journals that like to publish multidisciplinary research (e.g. *International Journal of Research and Development in Technology & Management Sciences*, an international multidisciplinary, peer-reviewed journal; and *Review of Integrative Business and Economics Research*). Similarly, some conferences with interdisciplinary approach are also organised.⁷

⁶ New stimulation programmes and approaches for dealing with multidisciplinary research have to be developed by the funding agencies.

⁷ Examples: SIBR 2015 Conference on Interdisciplinary Business and Economics Research: Advancing Knowledge from Interdisciplinary Perspectives Jun 4, 2015 to Jun 6, 2015 announced by Society of Interdisciplinary Business Research (SIBR) and Faculty of Economics, Thammasat University; and the National Conference on Gender Issues on Campus & in Society, Centre for Women & Gender Studies, Canara College, Mangaluru in collaboration with Mangalore Sociology Association held at Canara College, Mangaluru, held on January 23-24, 2015.

4. Creativity and Innovation in Research

4.1. Basic Principles

The basic research principles cannot be sacrificed. They are

- Objectivity
- Timeliness, and
- Innovation

Timeliness and relevance has to be considered at the stage of conception or research idea formation itself. Research data have a short shelf life and are target market specific. Research should be up-to-date and useful every time. Researcher then has to define research objectives carefully and clearly. Great data are not great if they answer the wrong questions! Final caution: researcher, *“do not conduct research to confirm decisions; that will be a waste of resources and will bias the outcome anyway”*. Researcher should engage in “innovation for transformation”. It has to be “the transformation of conceptual spaces” (Boden). In good hands, data becomes vital and vibrant information. That is creativity. Creativity is of paramount importance to the innovation process. Therefore, the findings of creativity research should be thoroughly considered in organisations where innovation processes are required. Creativity means bringing forth ideas that are original and useful. The elements of creativity are

- Imagination
- Intuition (instinct/perception)⁸,
- Ingenuity (originality)
- Insight, and
- Inspiration

Creativity, thus, can be defined as the combination of idea generation and idea validation. Again and again, novel ideas need to be incorporated into the innovation process (Figure 1). Creativity is even necessary before the actual innovation process can begin, and can thus, be considered as “pre-innovation”: Although the first idea itself might be elusive, it is prerequisite for scientific, technological or procedural innovation.

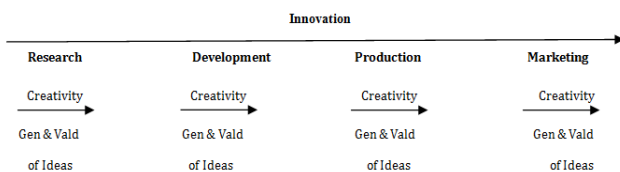


Fig. 1. The relationship of innovation and creativity.

As creativity is the source of innovation, it can well be claimed that creativity is essential for successful R&D and that creativity in R&D deserves special attention. For that researcher must be able to discern the types of creativity. There are five types of scientific creativity –

1. Formulation of a new idea (or of a set of new ideas) that

opens up a new cognitive frame or brings theoretical claims to a new level of sophistication (basic assumptions → theory, e.g. Einstein’s theory of specific relativity)

2. Discovery of a new empirical phenomenon that stimulates new theorising (observation → theory, e.g. Darwin’s theory of evolution)
3. Development of a new methodology, by means of which theoretical problems can be empirically tested (theory → method, e.g. Spearman’s development of factor analysis to test his theory on mental abilities)
4. Invention of a novel instrument that opens up new search perspectives and research domains (technique → new possibilities, e.g. scanning tunnelling microscopy which made nanotechnology possible)
5. New synthesis of formerly dispersed ideas into general theoretical laws enabling analyses of diverse phenomena within a common cognitive frame (single ideas → general theory, e.g. general systems theory)

All of these types of creative acts are achievements in their own right. Similarly, there are various components of creativity –

1. Expertise
2. Creative-thinking skill (out-of-the box): divergent thinking, or convergent thinking
3. Motivation: intrinsic or extrinsic

The emergence and effectiveness of creativity in research is by and large group creativity: Hence the importance of leadership, teamwork and interaction. A host of factors can influence the team –

- Work environment
- Perception
- Participation, etc.

The team shall be active in Creative Problem Solving (CPS) that involves –

- 1) Objective finding
- 2) Fact finding
- 3) Problem finding
- 4) Idea finding
- 5) Solution finding, and
- 6) Acceptance finding

4.2. Innovative Ideas⁹

As we all know, truly original ideas cannot be forced, but rather arise spontaneously and unpredictably, even to the inventors themselves. However, personnel departments – now known appropriately as “human resources” – prefer people who create in an orderly manner, bit by bit, on schedule. Reflecting this commodity-oriented mind-set, they prepare forms for the annual performance reviews that are more suitable for measuring the performance of automobile salespersons than research scientists.

Companies talk endlessly about how they encourage creativity and innovative research. At one outfit, we

⁸ Be a keen observer and critical thinker. See-think-feel; See-read-think-write.

⁹ If invention is considered the “engine of prosperity”, innovation is the wheel of progress.

constantly heard about “vision” and at another, more mystically, it was “*the vision*”, but, of course, vision actually clashes head-on with the conservative managerial mind-set. We have the combichem¹⁰ bandwagon: one of the bandwagons all the companies have jumped on is combinatorial chemistry. The idea is to stop thinking altogether – check your brain at the door – and just make random compounds. The chance that any particular compound will be active is very low, but if you make enough compounds, you might get a hit that can be developed into a useful drug. Infinity divided by infinity can be a real number.

5. Scope of Multidisciplinary Research

5.1. Barriers and Beyond

Today multidisciplinary research is considered the driver of innovation and research – we live in a fast changing world with complex, interdependent systems and subsystems. We need strategic management and value chain mapping of the systems and activities. We have approached understanding our world by deconstructing it into smaller and smaller fragments creating the disciplines and sub disciplines in order to be able to predict, or at least to explain, behaviour in nature, individuals, and society.

In today's knowledge landscape, there are powerful drivers for multidisciplinary research. Through simple collaboration, researchers from different disciplines can accomplish more by teaming. Interdisciplinary research moves beyond simple collaboration and teaming to integrate data, methodologies, perspectives, and concepts from multiple disciplines in order to advance fundamental understanding or to solve real world problems. Interdisciplinary research requires either that an individual researcher gains a depth of understanding two or more than one discipline and be fluent in their languages and methodologies, or more frequently that multidisciplinary teams assemble and create a common language and framework for discovery and innovation. They are ‘drive’ by inner urge and external forces. The drivers for interdisciplinary research are varied. In the first instance, nature and society by themselves are complex, and our innate curiosity to understand the elements and forces within them requires examination from the perspective of multiple disciplines. Importantly, we have a critical need to solve societal problems in a world that is subject to many forces –

- The example most urgently felt at this time is the consequence of failing to fully understand all of the forces unleashed by the free movement of capital and globalisation. Only a short time ago, our urgent focus was on climate change, where we must consider, among other things, how oceans and rivers are influenced by land use and the products of industrialisation,

atmospheric constituents and solar radiation. These subsystems are linked in time and space and have embedded in them multiple feedback mechanisms.

- The complexity presented in each of these real world examples requires interdisciplinary research that spans the natural and social sciences if we are to attain the kind of predictive capability that could inform policy makers.
- Finally, we know that the tools that we have available to examine our world are most often transformational when drawn from outside the discipline that developed them; such as the creation of the internet by the military and its impact on communication (and research!) in society.

Academic institutions are largely organised in ways that promote the advancement of individual disciplines, or sub-disciplines. Policies that govern hiring, promotion, and the allocation of resources often work against interdisciplinary research. If interdisciplinary research is to flourish in academia, then the reward systems in academia have to recognise the different pace with which interdisciplinary research may proceed and the fact that it is often a team rather than individual accomplishment. There also is a need for flexible organisational structures that can operate across discipline-focused departments. Directed institutes and centres with seed funding can encourage interdisciplinary research. However, advances that are more fundamental may emerge from creating a body of scholarly work that establishes common languages and frameworks in specific areas and examines what makes successful interdisciplinary research.

5.2. Training Researchers to Work at the Interfaces of the Disciplines

Training researchers who can transcend the barriers that exist between the disciplines requires innovation in teaching and learning. In the University setting, our training programs largely focus on in depth training in a discipline or a set of closely related sub-disciplines. To develop the pool of researchers who are best prepared for interdisciplinary research, we need undergraduate programs that provide depth in the major discipline(s) while also enabling students to participate in interdisciplinary courses and be exposed to research experiences that transcend the discipline of their major.

The potential for interdisciplinary research ultimately hinges on the extent to which individuals want to engage in it, and equally importantly if they have the opportunity to do so. Academia, national laboratories, and industry can create the opportunities and incentives to attract our best and brightest to this frontier. The individual interdisciplinary researcher is likely to be a relatively rare bird, and it will be the teams of researchers that are more the norm for advancing interdisciplinary research. Research teams are in themselves modestly complex social entities and in their 2004 study entitled *Facilitating Interdisciplinary Research*, a panel of the US National Academy of Sciences found that they were

10 The Combi Chem is a part of the Combi System, a family of different pump types having a high interchangeability in parts.

limited by the lack of a body of peer reviewed research in the social sciences that “elucidated the complex social and intellectual processes that make for successful interdisciplinary research.” While we have made some strides in thinking about the role of flexible structures and funding incentives to facilitate multidisciplinary teams coming together for a problem focussed effort or an area study, there is a need for social scientists to grapple with the more fundamental aspects of what facilitates successful interdisciplinary research. That is what enables high performance teams breaking down the barriers of language and culture and create knowledge that drives innovation for information. ICT tools do marvellous things in adding and editing information. With the use of internet, for instance research may have become faster and easier, but we cannot forget that we must have not only software systems, but also softer and safer systems. Research training must include this aspect too.

6. Conclusion

Research must be innovative and valid. Originality along with technical quality will be rated high. Our research needs to graduate from gathering and furnishing information to managing information in a life cycle of knowledge. Such knowledge can never go waste. In a sense, it is ‘strategic’ research. Good experience is acquired by establishing links between disciplines. If you can overcome the challenges associated with multidisciplinary research, it can be very rewarding to try moving into this direction. Multidisciplinary science requires a certain mind-set, openness for collaborations and capability to set aside your ego and share credit. In order to facilitate cross-disciplinary research, institutes should encourage interaction between different disciplines by organising events where scientists can meet and share ideas in an informal setting. Basic (fundamental) research or applied (decisional) research, Multidisciplinary research makes any research, directional. Multidisciplinary research requires an awareness of the relevant outstanding problems and on-going activities outside of your comfort zone.

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