

PERSPECTIVES ON INNOVATION, GLOBALIZATION AND R&D

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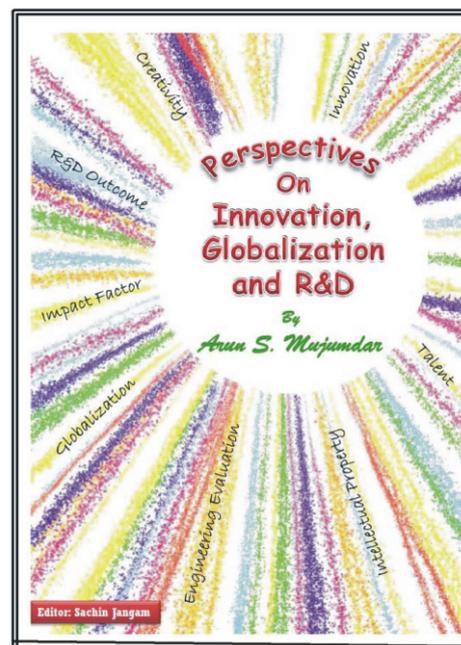
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This is a unique mini-book written by Professor Mujumdar over a rather long period of time as it distills the essence of his vast, peerless, and unique blend of experiences in academia around the world and industry. He is known for his prolific contributions to archival literature in heat and mass transfer, drying as well as a host of other interdisciplinary areas spanning numerous engineering fields and industrial sectors from pulp and paper to agriculture to foods to ceramics to minerals to pharmaceuticals, *etc.* His multi-national, multi-cultural and of course multi-disciplinary background and global exposure makes him uniquely qualified to write such a book. Indeed it is useful for senior seasoned academics and industry as well as government personnel dealing with any aspect of R&D from conducting, managing to funding it. Equally it is useful for novices *e. g.* senior undergraduate students and graduate students in all branches of engineering, applied sciences and management as well as young faculty members starting off their research career. Clearly, it is useful for those who fall between these limits as well. Professor Mujumdar deals more with applied research rather than basic research which needs to be dealt with (*e. g.* funded, assessed, *etc.*) differently. It is noteworthy that Nobel Prizes in sciences have usually been awarded after the basic discoveries were proven to be useful to society as large by engineering and applied R&D.

The intrinsic value and need for R&D is recognized by most nations. The developed nations reached their status via effective and efficient R&D. R&D is risky but the returns can be high. It depends on innovation and is affected by current trend towards globalization. Ability to carry out R&D – both in high-tech and low-tech industries depends on the quality of engineering education that can nurture talent. R&D requires human resources and also financial resources. It flourishes where both are present in adequate – not necessarily abundant – supply. Globalization has made the movement of finances and talent easier. As Prof. Mujumdar notes this mobility has tended to “flatten” the world in terms of R&D and industrialization. He discusses the need for developing nations to undertake different kind of R&D – that which fits local needs. He proposes “think global but act local” philosophy which makes sense. He also says that one should not “copy” other nation simply because they are economically successful since success does not simply come from the R&D or educational institutions but also the “surroundings” *i. e.*



local needs and resources available. Both developed and developing worlds need innovation and are influenced – both positively and negatively – by the fierce forces of globalization.

Since R&D is risky and expensive and depends heavily on scarce resources, it is important to decide how funding for applied research should be given by various agencies. Some objective yardstick is needed to assess quality of R&D carried out by academia and industry. Prof. Mujumdar provides some useful advice which is unique. For example, he proposes that research output, however measured, should be normalized by resources consumed. Too little and too much research funding is detrimental to the health of the R&D being funded. Thus, he proposes that there is an optimal R&D funding level that yields best returns. Of course, the optimal value depends on specific research area, as expected. Quantitative research is required to validate this idea. Considering the hundreds of billions being devoted to R&D – not all of it productive – such a project is highly timely and necessary. Professor Mujumdar discusses about the effective utilization of the R&D funds which are in the range of 1 to 2% of the respective developing countries GDP. Unnecessary expenditure in promoting “fashionable” topics such as nanotechnology everywhere is simply waste of talent as well as taxpayers’ money.

As the Editor-in-Chief of a major archival journal of long standing in a technology area, he is also interested in the value and assessment of archival publications. He writes about the pros and cons of metrics used today *e. g.* impact factors, citation counts, h factor, half-life of citations, *etc.* Young researchers and faculty as well as managers of research need to know this important information and what it means. It is easy to misuse – even abuse – such data, which are easy to obtain and hence used so extensively around the world. He discourages “closed loop” approach to academic research – a term he proposed over a decade ago in an Editorial. Essentially, this means research “in academia by academics and for academics is not sustainable as far as engineering or technology research is concerned”. It must be of societal value or else it will be questioned at some point in time since most R&D is funded by taxpayers in one way or the other – directly as in public sector and via tax credits in private sector.

This book is unique in another distinct way. It is written in small bites – short chapters – often with attractive titles. One can open any page and read the chapter and learn something new from it regardless of experienced one is. The perspectives offered by Prof. Mujumdar are worth reading and pondering over and indeed practicing. There is much pragmatic advice as well as simple philosophy about engineering education as well as academic research in engineering and its relevance to industrial R&D. He proposes a new Ph. D. program that challenges both sides of the brain unlike the current systems in place everywhere. He has provided some new thoughts on role of academic research – should it focus on commercially viable research/publications or on educating a highly skilled researcher. The book is thought-provoking and bold in many ways.

I recommend this book to anyone with anything to do with the theme of the book. It can be used for supplementary reading by senior design/research students at undergraduate level and for courses in R&D management as well. The reader will find many new ideas that are worthwhile to pursue. It is useful for industry and for academics. It is also useful for funding agencies who wish to get the most out of the funds provided for R&D. Even editors, referees and authors can benefit from some of the information and ideas outlined in this book. What is most interesting is that the articles are concise, easy to read, sometimes even entertaining and can fit one’s briefcase easily for easy reading even during travel.

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