



Editorial: R&D—How to Evaluate Value of R&D

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Editorial: R&D—How to Evaluate Value of R&D

In a previous editorial I touched upon some ideas regarding quantifying return on investment in R&D or cost-benefit ratio of R&D expenses, whether done in academia or industry. This is a theme worthy of voluminous treatises but that would not be a cost-effective use of my time or that of the inadvertent reader. So, I will be brief. Also, my comments refer to R&D in technology and not to curiosity-driven basic research, which is an ill-defined concept in itself.

Engineers know very well that the cost in terms of manpower, financial resources and time depends on how efficiently these resources are used for the intended purpose. For dryers, we know very well how to compute various efficiency parameters, basically as ratios of energy utilized to accomplish drying and the energy actually supplied for this purpose. Because some ambiguity is possible, indeed inevitable, in defining both the numerator and denominator of these ratios, we can have different numerical values but they must always be below unity.

In R&D we can also define an efficiency parameter more subjectively. A problem arises because the most efficient use of R&D resources does not necessarily yield a positive result. One can solve a wrong problem very efficiently. The annals of academic research are full of efficiently executed research projects, which yielded little technological or societal value. Or, despite very efficient use of all resources, the project output may be “ineffective” in solving a problem. Thus, effective R&D is not equivalent to efficient R&D. The latter requires knowledge, whereas the former requires wisdom. Defining the R&D problem and expected outcomes well is the first key step to effective R&D. Often academics are forced or coerced to research areas defined by external parties

even without sound background or track record. This removes the wisdom element from the get go!

One of the problems in measuring the success of R&D projects resides in our inability to distinguish between efficiency and effectiveness of R&D. Often efficient R&D is mistaken as effective R&D. Publication in high-impact journals and achieving high citation counts may be an indicator of efficient research but, unless its real impact on technology or society is clearly demonstrated, it can still be considered ineffective research. The library archives are full of oft-cited, efficiently accomplished research and R&D projects but a very small fraction of these have really made a dent in benefits to the societies that funded them.

Though researchers can be trained to be efficient, I am not sure that they can be educated to be effective in a short time. The latter comes from experience and self-learning from failures. Inefficient research will necessarily be ineffective. However, efficient research may yet be ineffective. Careful and effective mentorship is needed for young researchers to be effective; they can be efficient on their own.

Measures commonly used today by academia and granting agencies measure efficiency of the project execution. Effectiveness needs a longer time frame to be evaluated with some degree of certainty. I think this is an area worthy of scholarly research because so much is spent on R&D on a global scale without a reliable means to determine how much of it is really worthwhile and thus effective.

I have no simple answers to provide here, only a complex question to pose to our readers.

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