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Mitigating Technology Challenges in Life Sciences R&D

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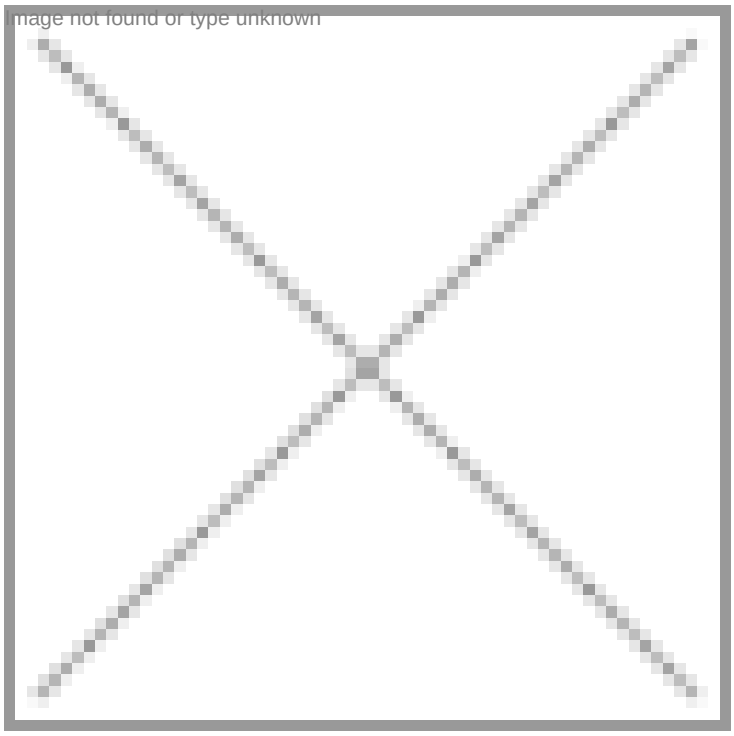
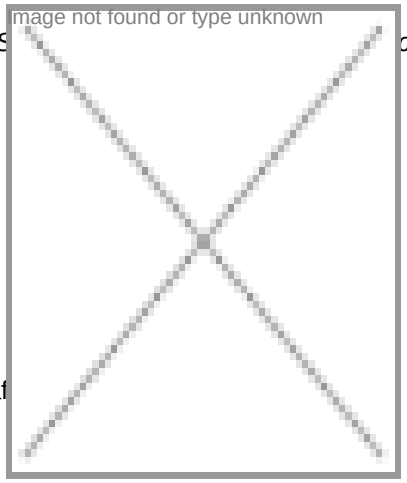


Mitigating Technology Challenges in Life Sciences R&D



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Two hundred years ago a man was born whose work on evolution changed the way we looked at our environment. Charles Darwin's book the "Origin of Species" proposed a process by which the amazing diversity that exists in nature has come by. That book proved to be a profound turning point for not only the scientific community of that time but to the general populace as well. Today we are experiencing a similar profound event. Deciphering of the genome sequences of many life forms and advancements in proteomics have been the definitive events in life sciences of our times. This progress combined with that made in the fields of engineered tissue systems and stem cells has since raised the expectations for miracle cures for many of the debilitating diseases

Unrealistic expectations more often than not undermine the promises held out by modern technology. The technologies in the life science R&D space are no exception. This is compounded by the uneven development of technology that goes into the drug discovery process, which forms an important component of the life sciences. Simply put, the technology evolution in some aspects of this process has not kept pace with that in other aspects. For instance highly advanced technologies are today available for the discovery, design and optimization of lead compounds for tomorrow's drugs. However the further refinement and eligibility of these candidates is still dependent on lengthy and expensive in vitro and in vivo testing processes. These processes remain time consuming and hence limit the time and cost savings brought to the new drug development process

by cutting edge discovery technologies.

The benefits accruing out of using computational tools for drug candidate discovery and optimization are well understoodand recognized. Such technologies enable a manifold expansion of the initial chemical exploration space, which is not feasible in a time and cost intensive laboratory-centric effort. They help the development of a robust molecule design criteria taking cognizance of the characteristics of the target protein and information of known active compounds against that protein from historical research. They enable multiple 'what if' scenario try-outs before even entering a laboratory. They allow pursuit of a structure-based research program even when the three dimensional protein structure is not available. Finally, they enable virtual screening of a chemical space on various aspects thus preempting later stage failures on account of efficacy, toxicity and bio-availability.

Usage of such technologies has effectively halved the time required to take a compound from the drawing board stage to the pre-clinical stage. Absence of proven technologies for the subsequent stages has more or less left the time lines for those stages intact. The need of the hour is the development of robust technologies that could quickly replace the time intensive laboratory experimentation phases. A wish list for such technologies would not be complete without inclusion of simulation models for cell level studies, organ level studies and whole animal studies. A complete replacement of in vitro and in vivo testing with computational simulation will of course be another example of unrealistic expectations but development of models that can contribute towards minimizing such testing would definitely be in the realm of today's technology. Fortunately, there are an increasing number of technology and domain experts who are putting their collective skills in developing such models but it would perhaps take a more concerted and focused effort from the scientific and technology thought leaders before such models could become available for regular use in the drug development process.

Mere availability of computational technology cannot in any way ensure a rapid R&D process. In fact, the efficacy of a discovery research program significantly depends on three factors. The first factor is the selection of the right technology, second is knowledge of the researcher about the limitations and strengths of the technology and the third and most important factor is establishing correct expectations from the technology, which has significant impact on the correct 'go–no go' decisions.

This brings to fore the second challenge facing the life science sector today; that of availability of skilled resources that can effectively leverage the power of technology. Significant investments will have to be made in training the implementers of these technologies to realize its true potential. A multitude of training centers have mushroomed in large and small cities of the country offering training in various bioinformatics tools. Although a laudable initiative in itself, better results from such effort could be ensured if the quality of training imparted has an oversight and guidance from an appropriate accreditation body.

Development of technologies to cover a bigger spectrum of activities in the life sciences R&D and training of resources on these technologies would go a long way in offsetting the challenges posed by modern times.