BOOK REVIEW

Review of *The New ABCs of Research: Achieving Breakthrough Collaborations*

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Ben Shneiderman, *The New ABCs of Research: Achieving Breakthrough Collaborations*. Oxford: Oxford University Press, 2016, 336 pp., ISBN: 9780198758839.

Ben Shneiderman has a long and distinguished scientific career as a researcher in the area of human computer interaction. I have always found his research fascinating, driven by very practical needs such as making computers easy to use. We tend to have very spirited conversations about research and sometimes disagree vigorously, but I think we both learn something from them.

His latest book, *The New ABCs of Research: Achieving Breakthrough Collaborations*, addresses a broad question, namely, what is an appropriate strategic mindset for collaborative scientific inquiry? Shneiderman critiques the traditional “linear model” of science where “basic research fuels the whole innovation system,” in other words, where basic research is the platform on which applied research and engineering development are built. He argues that such a model rarely “works,” and proposes that combining applied and basic research along with design produces higher impact research than viewing them as separate endeavors where basic always precedes applied.

Shneiderman proposes two related principles: The first is the “ABC principle” where real-world problems play a larger role in driving basic research. He describes several examples of the latter, a notable example being Google’s successful hybrid model of research.¹ The second is the “SED principle,” which calls for an active interaction between science, engineering, and design. Shneiderman presents examples where engineering or design drive basic research questions in contrast to the traditional linear model, arguing that many basic research breakthroughs would have been unlikely within the traditional linear model.

This time, I found it hard to find anything in Shneiderman’s book I disagreed with, which I must admit

was a little disappointing! I found myself nodding along throughout the book for a number of reasons since my own thinking as a graduate student was shaped by my mentor Herbert Simon who encouraged deep dives into problems to shape the basic research questions and to resist the temptation to generalize prematurely.

I found myself in agreement with Shneiderman’s narrative and the examples he presents, including the fact that the dominant players in the Internet space such as Google, Facebook, Microsoft, and Apple are applying the ABC and SED principles successfully. Indeed, at a recent symposium at New York University on the future of artificial intelligence (AI), Eric Schmidt stressed the importance of industry–academic collaboration, for example, by measuring advances on open real-world data sets available to the scientific community at large.² Schmidt alluded to challenges in water purification, synthetic food production, logistics of distribution, and optimal management of supply/demand of energy as some of the areas where our ability to leverage natural flow of data influence our ability to meet our collective needs. Facebook’s CTO Mike Schroepfer mentioned Facebook’s commitment to “10 year problems” and installing laboratories in the vicinity of university talent. These companies have arguably accelerated the pace of research in AI by leveraging university talent to address sensory perception problems central to their business models, which have led to algorithms with broader potential applicability within AI.

Shneiderman argues that a potential benefit of applied research is its potential to catalyze cross-fertilization among science, engineering, and design, where people have very different mindsets. Engineering is about bold aspirations, about creating things that do not exist, or making existing things better. Engineers create new artifacts through trial and error and prototyping. The related field of design encourages creativity in the context of available technology, driven by specific goals.

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Indeed, Simon characterized AI as a science of design, focusing on “devising artifacts to attain goals”³ through a process of intelligent search. Much of human endeavor is about the artificial! The importance of engineers is evident in industry, which is experiencing a surging demand for “data scientists” who combine strong science, engineering and data handling skills with the ability to work in cross-disciplinary teams. In some companies such engineers work closely with basic researchers not just to implement but also to shape the ideas and questions.

Shneiderman’s book also has a prescriptive aspect to it, proposing a combination of observation, intervention, and controlled experiments as key to knowledge discovery. Again, I nod in agreement, subject to the feasibility or luxury of using the three in combination. Sometimes, however, all one has to work with is observational data from which predictive models can be identified, but not causal models. Sometimes intervention and controlled experiments are too costly or infeasible. But if such interventions or experiments are possible or occur naturally, they provide a good basis to identify causal models, policy guidelines, and a clearer understanding of the problems themselves.

The prescriptive aspect of the book also extends to collaborative research where Shneiderman asserts that “teams often produce higher quality research than an individual can because they bring complementary knowledge, skills, and attitudes, take on more ambitious projects, and have larger networks.” The Internet has been a great enabler in this respect, and has spurred increased collaboration across geographic and disciplinary boundaries.

The book will probably resonate differently with various audiences for which it has different messages. For established researchers, it reinforces the basic principles of inquiry that is driven by real-world problems, and provides a good source of reference material of the ABC and SED principles. It also provides guidelines for researchers on how to form successful university–external partnerships.

For young researchers, the book offers some additional messages, including this key quote by Joshua Schimel “You don’t succeed as a scientist by getting papers published...Having your work matter matters. Success is defined not by the number of pages you have in print but by their influence. You succeed when your peers under-

stand your work and use it to motivate their own.” Shneiderman provides young researchers with some practical guidelines for how to do this to gain exposure in an increasingly connected community. As chief editor of *Big Data*, which has a large and diverse audience, this last point resonates particularly strongly with me. I always advise people to aim for accessibility to the reader. I can see from the download activity that articles with a simple and clear message in the abstract and writing generally experience large downloads. I typically decline putting articles into the review process unless there is a clearly stated claim that readers can easily understand and the authors deliver on it. I am constantly surprised at how often people fail to do this and just describe what they did or what they found.

For students, the book provides a similar message, but also a bit of history and philosophy of science to make its points and illustrate with vignettes how the ABC and SED principles have led to basic scientific advances.

For policy makers, business leaders, and government administrators, the book provides food for thought about incentives and organizations that are effective for creating research ecosystems that promote scientific advancement and address ambitious research problems. At a tactical level, it might encourage them to question the wisdom or use of the “broader impacts” section that is currently part of most research proposals. Shneiderman also directs his message at policy makers who he argues are still overly influenced by the linear model. He encourages them to embrace the ABC and SED principles, arguing that by bringing an academically grounded theoretical approach to real problems and working with practitioners who own the problem, such teams will have higher impact and are more likely to achieve the “twin win”: publishing influential results and disseminating validated solutions.

References

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