

## COLLABORATING CREATORS STILL HAVE PERSONAL PSYCHOLOGIES!

The Innovators: How a Group of Hackers, Geniuses, and Geeks Created the Digital Revolution

By Walter Isaacson. New York, NY: Simon & Schuster, 2014. 560 pp. Hardcover, \$21.00

Consider the following series of seemingly trivial sequence of events. One evening I received an email message from *AJP*'s book review editor inviting me to evaluate *The Innovators*. He gave me the option of receiving either a hardcopy by snail mail or an electronic file through the internet. Agreeing to do the review, and stating my preference for the eBook version, the following morning I got a message about my "gift" from Amazon.com, and in less time that it just took me to write these introductory sentences, the book popped up on my Kindle Fire carousel. Because I like to listen to music while I read, I activated Pandora, selecting a "station" appropriate to the text and got right to the task. Whenever I came across a word or proper noun that was unfamiliar, I'd just pressed my finger on the screen and up would pop the proper dictionary entry or, if I so opted, an appropriate Wikipedia article or the Google search engine. Once I satisfied my curiosity, I would then just tap the back arrow to return immediately to where I left off without ever leaving my seat. Later that day I felt it necessary to look over recent *AJP* book reviews just to get a general picture of the formatting configuration, which I accomplished with only the minor inconvenience of a logon and database search, soon obtaining a few pdf's to provide some guidance. Finally, I finished reading the book, wrote up my review on my desktop using my trusty mouse and quiet ergonomic keyboard, and emailed the Word file as an attachment to the editor. After a short time interval in which one electronic document was largely just converted to another, my review now appears before your very eyes, most likely on a desktop, laptop, tablet, or smart phone rather than on a few bound pages of cellulose fiber.

For early baby boomers like me who were born about the same time that transistors were first invented, this event sequence remains remarkable rather than mundane. The episode exemplifies the “digital revolution” discussed in the book under review. None of the events were possible when I was a young adult. There was once a time when all mail was snail mail, all books including dictionaries and encyclopedias printed on paper, all non-live music either broadcast on radio stations or else heard on home record players. When I first learned computer programming, my (Fortran) instructions had to be laboriously punched on “IBM cards,” the resulting thick stacks entered through an often temperamental reader, and assigned to a seemingly interminable “batch” queue which required me to trek back to the computer center the next day to retrieve an over-sized “green-bar fan-paper” printout to see whether I still had yet another bug to fix. Remote terminals, time-sharing, interactive computing, and electronic output were still well into the future. So was PC word processing, email, the World Wide Web, Portable Document Files, home Wi-Fi, and, of course, eBook readers. Although keyboards carried over from those more ancient times, they were not the same, nor what they connected to. I typed my own doctoral dissertation on a noisy and klutzy typewriter, each page having to be error free – no “white out” permitted – and thus requiring that a partially typed page to be ripped out at the slightest mistake. I don’t miss the “bad old days” at all. The digital revolution changed more lives in more positive ways than even the Gutenberg printing press could possibly achieve.

### **The Digital Revolution**

Many revolutions can be described in terms of a relatively small number of individuals whose names and achievements become a conspicuous part of the most elementary historical accounts. The eponymic “Gutenberg Revolution” provides a prototypical case. As Isaacson points out, the digital revolution was a much more egalitarian effort, where group genius largely

replaced individual genius (cf. Sawyer, 2007). This striking feature is visually represented by the sheer number of photographs that permeate the book, providing portraits of the key figures. The pictures run into the dozens. Although some of the faces are familiar, even iconic, many more are far less so, and even their names are outright obscure. Many people in the world will easily recognize a photo of Bill Gates or Steve Jobs. But who among us can name all of the “traitorous eight” who left Shockley Semiconductor Laboratories to form Fairchild Semiconductor – or perhaps even identify the two among these traitors who later co-founded Intel?

Admittedly, Isaacson’s conception of the digital revolution is very inclusive, far more so than any treatment of Gutenberg’s printing press. This breadth is evident in the succession of the book’s dozen chapter titles: Ada, Countess of Lovelace; The Computer; Programming; The Transistor; The Microchip; Video Games; The Internet; The Personal Computer; Software; Online; The Web; and Ada Forever. The only chapters seemingly linked to a specific person are the two framing chapters honoring Ada Lovelace, the pioneer mathematician and profound thinker who can without exaggeration be called the world’s first computer programmer and philosopher of computer science. The 10 chapters sandwiched between her two chapters treat broad domains of innovation that must necessarily involve multiple names. Because so many different “hackers, geniuses, and geeks” were involved in the emergence of, say, personal computers – note my shift to the plural – the author had no other choice but to discuss an extensive inventory of contributors.

The historical period covered is also very broad, from Charles Babbage’s 1837 initial concept of the Analytical Engine to innovations in the first decade of the 21st century. Nor should this amaze us: The Scientific Revolution also lasted about two centuries – conventionally from Copernicus to Newton. Whether the Digital Revolution has likewise attained its climax

remains to be seen. Although this book narrates the history right up to the end of 2013, enough unanswered questions remain to suggest the need for a second edition some years down the line.

### **The Individual Innovators**

One might think that the psychological aspects of the digital revolution would be given the back seat in a book emphasizing group genius. Yet this turns out to be far from the case. Although Isaacson's undergraduate training concentrated on history and literature, and his career was devoted to print and electronic journalism – most notably as editor of *Time* magazine and CEO of CNN – he has established a firm reputation as a biographer. His biographies span Henry Kissinger, Benjamin Franklin, Albert Einstein, and, most recently, the authorized biography of Steve Jobs, which became a *New York Times* bestseller and Amazon's #1 seller for 2011. Accordingly, Isaacson takes an obvious interest in the personal characteristics of each major historical figure. For example, every time he introduces a major new player in the digital revolution, the author provides a mini-biography, suggesting that individual family background and educational experiences remain relevant to understanding collaborative creativity.

Furthermore, the book is replete with such expressions as “like most innovators” (Chapter 1), “also had a trait, so common among innovators” (Chapter 2), and “a prime example of an innovator's personality” (Chapter 9). Hence, the author implicitly subscribes to the notion that exceptional innovators exhibit a distinctive profile of personality traits. Some of these traits are perhaps not very surprising, such as a certain stubborn rebelliousness reflecting a willingness to “defy the crowd” (cf. Sternberg & Lubart, 1995). Yet other characteristics might prove a bit more surprising. For instance, whatever our personal stereotypes may be of electrical engineers and computer scientists, Isaacson makes the point that the biggest innovations often came from those who had considerable artistic interests. This tendency actually goes way back to Lady

Lovelace herself, the daughter of the English Romantic poet Lord Byron. Indeed, it was Ada who first addressed the issue of whether computers could display artistic creativity rather than just solve algorithmic math problems. This personal inclination probably ties in with the more general empirical finding that highly creative people score higher on Openness to Experience, a personality dimension that includes aesthetic sensibility as a facet (McCrae & Greenberg, 2014). To offer an illustration, Galileo's telescopic discovery of the lunar mountains was facilitated by his artistic interests, especially his expertise in chiaroscuro (Simonton, 2012).

Most critically, Isaacson makes it clear that these individual experiences and personal traits don't go away simply because somebody becomes a member of a collaborative group. On the contrary, the distinctive attributes of each group member very much define the nature of the creative collaboration, including its success or failure. Thus, the author suggests that Robert Noyce's conspicuous Congregationalist background and madrigal singing experiences influenced the distinctive non-hierarchical management style that became so evident at Intel. In contrast, William Shockley's increasingly paranoid and authoritarian personality rendered him incapable of properly managing the very promising first startup in what was to become the Silicon Valley. Very often collaborative teams would combine two or more people who were very different in expertise and disposition, yet who fit together quite nicely as separate pieces of the same puzzle. Probably the best known example for most readers was the "two Steve's" (Jobs and Wozniak) of Apple fame, but similar illustrations permeate *The Innovators*. In fact, the first such collaboration of complementary opposites goes back to Lady Lovelace and Charles Babbage.

Hence, even if collaborative groups might exceed the sum of their parts, the parts remain distinct – more like the separate players of a baseball team than the workers in a bee hive.

## The Psychological Research

Because Isaacson is not a psychologist, he includes no references to the psychological research on scientific or technological creativity (see Simonton, 2013, for review). Yet if he had incorporated these findings into his treatment, he might have made two observations.

First, the empirical research has enhanced our understanding of the cognitive processes, developmental experiences, personal traits, career trajectories, and social contexts involved in the generation of innovative ideas. Some of these results might have shed light on the author's discussion in various places. For instance, Isaacson mentioned that William Shockley had taken an IQ test as part of the initial screening for Lewis M. Terman's (1925-1959) monumental *Genetic Studies of Genius*. Shockley did not score high enough to make it into the longitudinal study. Yet it would have been interesting to point out that Shockley was not the only future Nobel laureate in physics who failed to satisfy Terman's cutoff for a "genius" IQ: The same fate was bestowed on Luis Walter Alvarez, albeit the latter did not have the rather adverse reaction that Shockley did to the experience, as reported in *The Innovators*. Isaacson could also have noted that of the more than 1,500 children who did demonstrate sufficiently high IQs to enter Terman's sample, not a single one grew up to win Nobel Prizes like Alvarez and Shockley. Indeed, the psychological findings suggest that IQ is of limited usefulness as a predictor of scientific creativity (Simonton, 2013).

Second, besides conducting empirical research, psychologists have put forward complex predictive and explanatory theories of the creative process, especially in the sciences. Particularly useful in this regard are those theories that view creativity as a combinatorial process (Simonton, 2004; Thagard, 2012). These theories have been translated into both mathematical models and computer simulations (Schilling, 2005; Simonton, 1997; Thagard & Stewart, 2011).

Significantly, these theories can explain how new ideas are generated from old ideas as well as how it can happen that two scientists can independently make the same discovery – two issues discussed in Isaacson’s book. Despite the abstract nature of these combinatorial models, they have been successfully applied to concrete historical individuals. For example, Simonton’s (1997) combinatorial model of career trajectories has been applied to the scientists Antoine Lavoisier, Claude Bernard, and Hans Adolf Krebs (Holmes, 2004) as well as to the inventor Thomas Edison (Simonton, 2014). These models provide a baseline for understanding the extent to which each creator’s life and work is unique.

One might think that psychological research would provide less guidance with respect to the author’s main thesis because psychologists focus on individual rather than group creativity. Yet because the latter does fall properly under the subdiscipline of social psychology, social psychologists have conducted research on collaborative creativity (Paulus & Nijstad, 2003). This work suggests, for instance, that creativity increases when group membership is heterogeneous rather than homogeneous with respect to various attributes, including background and expertise. Many of the most creative collaborations discussed in this book were precisely of this nature.

### **The Final Evaluation**

It has become conventional practice for negative comments or qualifications to appear at some point in any book review. At the very least, such criticisms should establish not only that the reviewer actually read the book but also that he or she had sufficient prior knowledge to offer an expert opinion. The problem with that expectation is that I really don’t have anything negative to say. I couldn’t even find any mistakes or typos that would allow me to assert with a critic’s usual superciliousness that “this book could have used some major editing.” In fact, the author had already precluded such problems by circulating drafts among experts and posting portions

online for comments. Given Isaacson's professional credentials, we would also expect him to maintain very high standards for his own writing.

So imagine my glee when I discovered one teeny-weeny oversight! When discussing the early 1960s, the author mentions "Dick Alpert, and other new age prophets" (p. 269), but when narrating events about 20 years later the author refers to the "counterculture luminaries Ram Dass and Wavy Gravy" (p. 388). I'm pretty darn sure Alpert and Ram Dass are the same person, the former having received his new name from his guru in India around 1967. The only reason why I spotted this oddity is that in the early 1970s I was a graduate student in Harvard's Department of Social Relations, where Richard Alpert had notoriously collaborated with Timothy Leary on experiments using psychedelics. Although they were both long gone before I arrived, their exploits – as well as those of poet Allen Ginsberg, their comrade in arms – had become legendary in my department, especially among graduate students who were exclusively undergraduates in the 1960s. Even if Isaacson was a Harvard undergrad almost exactly the same years that I was a graduate student there, he was associated with different departments and so may not have known the connection. Or the two passages were too far apart in the text to notice the disconnection.

So, that's it – the best so-called "criticism" I can muster! Having thus exhausted the negative, I would like to close with the positive. The book is not only highly informative but also extremely well written, so much so that I found it hard to put down – which is pretty amazing for a work of nonfiction on a somewhat technical subject. I consider it a must read for anybody who is curious about how the digital revolution got us to where we are today. The book also offers concrete cases regarding how creativity operates in the real world beyond laboratory experiments and psychometric tests. Apropos of its subject matter, too, I would strongly recommend reading



the eBook version while connected to WiFi. Besides the internal links, such as the index entries with numbers leading directly to the correct page, both the text and the extensive notes provide numerous hyperlinks that take you on fascinating excursions with a single touch. As an example, one tap took me to a webpage showing a picture of the actual moth that represented the first literal “bug” ever found in a computer system. After all, if you want to read an excellent book on the digital revolution, what better way to do so than to read it on one of the most obvious manifestations of that revolution? The medium then becomes part of the message!

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