



*From Science to Start-Up: The Inside Track of Technology Entrepreneurship*

By A. SETHI

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In recent years the pole of intellectual challenge and excitement has undoubtedly shifted from the University, where it lay for the past hundred years or so, to the small, high-tech company in the private sector.<sup>1</sup> Learning about this world does not really form part of current educational curricula. Of course, as the trend towards start-ups continues, it will become more common among children for their parents to be engaged in them, but meanwhile this book provides absorbing reading for people considering starting up a business, both from the technology side and from the business driver side (it being rare to find these two aspects combined in a single person). Sethi points out that “if you only connect the dots with the number on them, you will never build a new picture” (p. 12). It is a sad fact that the gradual incursion of the grant system into science funding has led to “the balance of types of research undertaken [being] heavily weighted towards a pedestrian style of investigation in which not only the problem but the entire pathway to the destination is mapped out in detail. The relationship of this type of investigation to real exploratory research is about the same as the relationship of ‘painting by numbers’ to the work of a Picasso, a Segantini or a Rembrandt”;<sup>2</sup> and this incursion, which has reached a position of overwhelming dominance today, accounts for much of the dullness and unattractiveness of contemporary academic research. It is very important to show students who wish to continue intensive scientific work after completion of their bachelor’s and master’s degrees that there is an option other than continuing in academia. The PhD (or DPhil), formerly an indispensable apprenticeship for becoming a researcher, may no longer serve its true purpose—many doctoral studentships, such as those funded by EU “Framework” research & technical development (RTD) projects, require the student, as all the participating scientists, to adhere to a detailed work plan replete with serried milestones and deliverables, allowing little room for the creativity and academic freedom that were formerly intrinsic to the higher degree.

The author identifies three kinds of start-ups, “route-to-market”, which “primarily focus on providing a new business model to as large a group of users as possible”, and whose “main focus is therefore the speed of scaling up”; “starting from pain”, which try to address a problem; and “technology-driven”. This book deals with the third kind, and assumes that the reader does not have his or her own technology; in other words, it is addressed to the business driver; nevertheless, both the technologist and the investor will also find the book illuminating, if they have the time to read it, not least for helping them to deal more effectively with the other parties in the business.

Overall, this is a very endearing book. The author has the tremendous advantage of writing from direct, practical, “hands-on” experience as a business driver and entrepreneur, who worked with an

<sup>1</sup> During that century of university dominance, the excitement was shared by the research laboratories of large corporations. AT&T Bell Laboratories may have been a global cynosure, boasting rather more Nobel Prize winners than its rivals, but there were many others; for example, in 1956 the British company United Steel (nationalized in 1967) created a Department of Operations Research and Cybernetics, in which about 70 people, headed by Stafford Beer, worked. Although most large corporations still maintain some research activity, much of their work is concerned with scale-up and regulatory compliance; new ideas are mainly imported by acquiring small start-ups.

<sup>2</sup> J.J. Ramsden, The tyranny of success. *J. Biol. Phys. Chem.* **10** (2010) 51–52; see also A. Hüttenhofer, *J. Biol. Phys. Chem.* **16** (2016) 184–187.

initially academic technology team to set up a business, Flisom AG (which is still in existence). As a former academic who abandoned a full-time position five years ago to embark upon starting up a high-technology company, I am, therefore, well familiar with both aspects of start-ups and can substantiate the plentiful good sense that fills this book. It is, furthermore, well written (from a stylistic viewpoint) and addressed to an intelligent reader, thus distancing itself by a considerable amount from the style of most other books on the topic, which contain such gems as “Post your profile on LinkedIn and Twitter, and join in start-up discussions”.<sup>3</sup>

Sethi paints a fair picture of the investor in a start-up; assimilating this picture should do much to unruffle the often fractious relationship between investor, business driver and technology team.<sup>4</sup> Clearly both the investor and the technology are needed if anything is going to happen. It is another sad fact that, without the investor, the technology would quietly join that overcrowded category of supernumerary inventions, whereas without the technology, the investor can find plenty of other objects worthy of support, at least from the viewpoint of their likelihood of yielding an adequate return, such as yet another retail outlet or a speculative property acquisition. These might not “make a difference” in the sense insisted upon by some investors;<sup>5</sup> on the other hand, an invention that people really want and will pay for accrues more merit than any number of purely philanthropic gestures.

Provided, one might be inclined to add, that the technology contributes to the elevation of society. Summing up the grand decades of the technology revolution in the 19th century, in which university activities played little part, Weir remarked that “beneficial undertakings had been proved profitable”.<sup>6</sup> Even at the time he was writing, however, profit, rather than benefit, was becoming the priority. On the other hand, von Mises has argued that “it is not the task of government to improve the behaviour of its ‘subjects’. Neither is it the task of businessmen. They are not the guardians of their customers. If the public prefers hard to soft drinks, the entrepreneurs have to yield to these wishes ...”.<sup>7</sup> The role of the government is merely to provide a stable framework (comprising a good legal system, general orderliness in society, basic infrastructure and the like).

Sethi seems to be somewhat ambiguous regarding the role of governments with respect to start-ups. The most cryptic two sentences in the book are “Some US companies got loans and loan guarantees from the government averaging \$300–500 million. They failed as a consequence the USA risks losing its appetite for new-generation clean energy companies” (p. 71). I should like to put a semicolon after “consequence”: I have seen many start-ups that seemingly survive

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<sup>3</sup> This is from M. Zwilling, *Start-Up Pro: How to Set up and Grow a Tech Business* (December 2014). The trouble with this and many other books of that ilk is that they are written by people lecturing on the topic who have not themselves actually started up anything, and they are filled with a great deal of generic advice, in itself unexceptionable but mostly rather dull to read.

<sup>4</sup> In common parlance, “the investor” means the person or organization putting money into the start-up. The technical team and business driver invest their time and intellectual capital.

<sup>5</sup> “Making a difference” is a key motivator for a surprisingly high proportion of those forming a sustainable start-up—that is, the investor,<sup>4</sup> the technical team and the business driver. Sethi describes how realization that the product of his start-up, flexible photovoltaic solar panels, could have made a significant contribution to the disaster relief effort after the great 2004 tsunami, was an important motivating force for him.

<sup>6</sup> A. Weir, *The Historical Basis of Modern Europe*, p. 394. London: Swan Sonnenschein, Lowrey & Co. (1886).

<sup>7</sup> L. von Mises, *Bureaucracy*, p. 27. Grove City, Pennsylvania: Libertarian Press (1996) (first published in 1944).

indefinitely by getting grants from national or European Union funding agencies, while the commercialization of the technology is never actually consummated. Such companies may lack the buzz of one that has cut itself free from such constraints (but may nevertheless provide a more congenial environment than a university department). There is, in fact, rather strong evidence for the dampening effect of government-provided funds for new technologies, primarily because they “crowd out” potential private funding,<sup>8</sup> but also because government funds are, ultimately, controlled by civil servants and, as Parkinson has pointed out, “public administration has had a bad effect on business. For while the civil servant’s methods may be similar, his aims are different. For him, the file is an end in itself. Why? Because there is always the possibility of a public enquiry ... The civil servant wants to show that he took the right decision, gave the right advice, asked the right questions and obtained the right facts before placing the right minute before the right authority. What actually happens is of little consequence. It is the file that has to be in order, not the people or things to which the file relates”.<sup>9</sup> The point of Figure 5.4 in Sethi’s book seems to be to indicate that big government loans (soft loans to Chinese companies) gave the recipients a competitive advantage. Establishing the validity of that proposition would require a considerably more comprehensive argument. Both Switzerland and the UK, two of the world-leading countries for start-up activity, have government agencies engaged in promoting start-ups (the *Commission for Technology & Innovation* and *Innovate UK*, respectively). Unsurprisingly, these agencies cultivate the view that they play an important role in boosting start-ups. Nevertheless, even if the intensity of their activity is indeed correlated with start-up intensity, that does not, of course, indicate that they are the *cause* of that intensity; it could equally well be the other way round.

The point about the success of venture capital in accumulating ever larger funds is well made—it causes difficulties for start-ups because a fund can only manage a certain number of projects, hence as the fund becomes bigger the individual projects in which it invests must become concomitantly bigger, often too big to suit a typical start-up. Unconventional sources of capital are also considered. Crowdfunding gets a brief mention—this seems to be overrated and before it deserves serious consideration a critical evaluation of its successes and failures so far is really needed. Switzerland is apparently fortunate in having many entrepreneurs who, having made their fortune, give some of it away in the form of awards for promising start-ups. Nevertheless, receiving these awards is not universally perceived to be beneficial.<sup>10</sup>

The author candidly admits that “for those of us who do not have a PhD but are in contact with reality, the world of scientists and research holds a certain aura and mystique”; the word “breakthrough” is frequently used in the book. In this context it is sobering to recall Peter Kapitsa’s definition of a “new phenomenon”—a natural phenomenon that can neither be foreseen nor explained on the basis of existing theoretical concepts.<sup>11</sup> They are few and far

<sup>8</sup> T. Kealey, *Sex, Science and Profits*. London: Vintage Books (2009).

<sup>9</sup> C.N. Parkinson, *In-Laws and Outlaws*, p. 134. London: John Murray (1964).

<sup>10</sup> U. Fueglistaller and A. Fust, Entrepreneurship awards in Switzerland and the effect on the development of start-ups and SMEs—an empirical study about the Swiss awards, the award winners and those who refused to take part in the award contests. Proc. 3rd Annual International AGSE Entrepreneurship & Innovation Research Exchange, Auckland (2006).

<sup>11</sup> P. Kapitsa, The future problems of science. In: *The Science of Science: Society in the Technological Age* (eds M. Goldsmith and A. Mackay), pp. 102–113. London: Souvenir Press (1964).

between—Galvani’s discovery of electric current in 1789, Oersted’s discovery of the influence of electric current on a magnetic needle (1820)—perhaps only three or four in a century, and the aura and mystique should be reserved for suchlike.

The point about engineering overkill (p. 73) deserves expansion. There are some circumstances in which it would appear to be justifiable—in the pharmaceutical and medical device industries, for example. But anything to do with health falls into a special category, because of the difficulty of properly pricing health benefits.

The book concludes with a chapter of examples of successful start-ups from the ETH Zürich—they are a illuminating and instructive. The snippets in the penultimate “putting it into perspective” chapter are interesting but too brief to serve as more than triggers for discussion. Sethi is clearly intrigued by the differences in entrepreneurialism among different countries. Differences there certainly are; Table 1 collects some data, which tend to confirm that Switzerland, the UK and USA are the most entrepreneurial countries nowadays. It should be emphasized that this is only a first approach to making a proper comparison. “Start-ups” as defined in the Table are those that registered themselves on a certain website—an action that in itself indicates an entrepreneurial mentality. It is also clear that Germany manages to be a successful economy with relatively little start-up activity.

Table 1. Start-up activity in selected countries.

Country	Population <sup>a</sup> /10 <sup>6</sup>	Biotech <sup>b</sup>	Start-ups <sup>c</sup>	New businesses <sup>d</sup>
China	1338	4	38	–
France	64.9	8	350	94,927
Germany	80.6	3	515	(61,950)
Hungary	9.8	–	227	24,479
India	1342	–	3333	98,029
Ireland	4.7	3	66	17,601
The Netherlands	17.0	3	275	58,900
Switzerland	8.5	2	226	(10,847)
UK	65.5	9	1170	(390,200)
USA	326	76	8441	–

<sup>a</sup> From <http://www.worldometers.info/world-population/population-by-country/> (accessed 20 March 2017).

<sup>b</sup> These are biotech start-ups in receipt of venture capital A round funding. From B. Huggins, *Nature Biotechnology* **35** (2017) 16.

<sup>c</sup> These are the numbers of high-tech start-ups that registered themselves on the website <http://www.startupranking.com/countries> (accessed 20 March 2017).

<sup>d</sup> World Bank data for 2014 (2004). From <http://data.worldbank.org/indicator/IC.BUS.NREG> (accessed 20 March 2017).

As I mentioned before, the content of this book strongly resonates with my own experience in similar situations. Had I read it five years ago, would it have saved me some grief? Very possibly; at the very least it might have given me some encouragement that what I was experiencing was by no means unusual and that it was reasonable to expect the ultimate outcome to be good. It is hard to effectively substitute learning from actually going through the experience by learning from merely reading, but the content of this book is probably as close as one can reasonably get to practical experience by reading alone.

J.J. RAMSDEN