ENTREPRENEURIAL EXPERT

TOM HOCKADAY:
THE OXFORD PROCESS OF IDEA TO OPPORTUNITY

By

Richard J. Goossen

You don't make money out of technology—you make money out of a business that successfully commercializes technology.

Tom Hockaday
Interview with Rick Goossen

Introduction to Tom Hockaday

KEY DATA:	
Name	Tom Hockaday
Title	Managing Director
Affiliation	Isis Innovation Ltd., University of Oxford
Education	B.A. (Hons.), King's College, London
Experience	University College, London (1989-93); Managing Director, Bristol Innovations Ltd., Bristol University (1993 – 2000); Director of Special Projects, Isis Innovation Ltd. (2000-06), Managing Director, Isis (2006 – present); and Chairman, UNICO, the UK's university technology transfer association (2003)
Website	https://www.isis-innovation.com

Biographical Highlights

- Since 1989, Hockaday has focused on the "twilight zone" (as he describes it) between university research and business.

- Hockaday on job satisfaction: "Taking early stage technology and trying to get that technology applied and used in a positive way is quite satisfying."

- Tim Cook, Deputy Chairman of Isis, on Tom Hockaday: "Tom built up Tech Transfer in Bristol over seven years from 'nothing' to 'quite good'… As Mr. Technology Transfer in Bristol, he had a high reputation in the national professional network of technology transfer." (Nov. 2004, *Oxford Science Enterprise Newsletter*)

- Since 1997 (Hockaday has been involved since 2000), Isis has launched 57 spinout companies and only 3 have gone bankrupt—an impressive 95% success rate for launching start-up ventures.

Author's Note

I have included Tom Hockaday in this series because of his practical expertise in technology transfer. Though he has not published extensive academic writings on entrepreneurship, his position, qualifications, and experience speak for themselves. This profile is based not only on my interviews with Hockaday, but also on several supplementary sources. I provide a general introduction on ideas and opportunities within an entrepreneurial context. I have also incorporated comments from published interviews with Tim Cook, Deputy Chairman of Isis, and Kevin Matthews, CEO of Oxonica (an Isis spin-out company featured in the chapter). Throughout the chapter, I attempt to clearly delineate Hockaday's comments from those of myself and others.

Introduction: The University of Oxford model of technology transfer

How can researchers, toiling away in a laboratory in the "ivory towers" of the academic world, successfully convert discoveries to marketable products? This question is also relevant in a broader context: how do nascent entrepreneurs prudently determine whether or not markets exist for their ideas? The researcher and the nascent entrepreneur both face the same challenge. A valuable research-based invention—whether a product, medication, or service—may be a necessary starting point, but it won't guarantee the successful launch of a new venture.

Often researchers and prospective entrepreneurs do not understand the vital distinction between an idea and an opportunity. They come up with a brilliant cure, or a new product, and they assume people will respond with overwhelming interest. This is the so-called "mouse trap fallacy": believing that, as Ralph Waldo Emerson once said, "If you… build a better mouse trap, the world will beat a path to your door."[1] Such thinking has falsely enticed many individuals into bold new ventures, only to leave them bankrupt and confused. Then they realize that success requires much more than a good idea.

One would expect that the University of Oxford's researchers,[*] compared to those at other educational institutions in the world, would be among the most well-situated to prosper in the marketplace. Oxford's prestigious international reputation alone would provide an invention with a patina of initial credibility. Yet even a good idea, supplemented by institutional credibility, must have market interest to move from a laboratory to a store shelf. This process is more complicated than inventors—whether at Oxford or elsewhere—may anticipate.

[*] I subsequently refer to the University of Oxford as either "Oxford" or the "University."

In order to understand the transition from idea to business opportunity at Oxford, an historical overview of the University and its technology transfer program provides important contextual information.

Oxford was founded in 1167. The first example of transferring research knowledge from the University and bringing it in a practical way to the marketplace—the process of "commercialization"—involved printing technology: Oxford published its first book, the Bible, in 1478.[2] Since then, printing has become a critical component of the University's identity. Oxford University Press is a flag-bearer of the institution's brand name, and, with a presence in more than fifty countries, is the largest university press in the world.[3] In fact, Oxford University Press owns the trademark for the word "Oxford."[4] Consequently, any new venture that wishes to use the word "Oxford" in its name (and is launched by an Oxford researcher) requires permission from the Oxford University Press.

Despite the long history of commercialization at Oxford, however, the University was not able to exploit its academic base of world-leading research expertise until the Margaret Thatcher era of 1979 to 1990, when the British Government began to privatize many state-owned industries.[5] Thus, in 1988, the University established a wholly-owned technology transfer company under the name Isis Innovation Ltd. ("Isis").

Tom Hockaday, a native of the town of Oxford, joined Isis in 2000 as Director of Special Projects, and he has been Managing Director since 2006. Hockaday lives in an 18th century farmhouse with a large garden twenty miles north of Oxford. The views are fantastic and it provides a respite from the daily stresses of work and life. The entire Isis team consists of a team of about 40 individuals; Hockaday has seven members reporting directly to him. He enjoys the

camaraderie of the team and believes that "good people do good thing; better people do them even better."[6] Hockaday notes that Isis has had an "absolutely enormous" positive impact on Oxford so far.[7] One of the benefits of his position is that he on speaking engagements from Europe, North America and Asia talking about technology transfer.

The role of Isis is to manage "the University's intellectual property portfolio, working with University researchers on identifying, protecting, and marketing technologies."[8] These tasks are significant, as the research foundation of the University encompasses 4,200 researchers and 6,700 doctoral students in life sciences, physical sciences, social sciences, and humanities.[9] Isis provides these accomplished individuals with "commercial advice" and "funds patent applications and legal costs, negotiates exploitation and spin-out[†] company agreements, and identifies and manages consultancy opportunities."[10] In other words, Isis effectively acts as a new-venture incubator for its researchers.

After valuable research is identified, Isis will then decide which of three different means of commercialization is most suitable: licensing, launching a spin-out, or a material sales agreement. First, Isis may license a technology to companies who will invest in developing and selling that technology. This is a straight forward route to the marketplace when a company that can effectively use the technology already exists. Isis selects companies as license partners based on their resources and intentions for technology development in the market, as well as

[†]A "spin-out" is a type of "spin-off" where a company splits off from its root organization to become a separate legal entity. The spin-out company takes intellectual property and technology from the parent organization. For example, Isis will have a spin-out (such as Oxonica Materials plc, highlighted in subsection 5.3) enter into agreements to transfer the key technology and licensing agreements to the University, in exchange for permission to use the "Oxford" name. In most instances the University (through Isis) is a part owner of the spin-out company, arranges professional and consulting services, and possibly provides physical office/research space for the company.

their commitment to developing products or technologies in a timely and ethical manner. For example, with respect to ethics in the health care sector, Isis licensees must ensure that final products are accessible and affordable in developing countries.

Second, Isis may create a spin-out company. When there are no available license partners, as the research may be in a field with few established firms (or the existing firms may have different strategic priorities), then Isis determines if the value of the research warrants the establishment of a spin-out. Since this process, as opposed to other forms of research advancement, requires Isis to commit resources, it presents the potential for greater upside—and risk—for both the researcher and the University.

Thirdly, Isis may simply engage in "material sales." In such an instance, licensing or starting a spin-out may not be practical options. Instead, Isis may simply negotiate a straight-forward sales agreement for materials developed within the University (i.e. biological and physical science materials). This is the lowest risk proposition for Isis, as it merely involves the sale of a researcher's product for a specified price. Isis has previously entered into materials sales related to discoveries of antibodies and protein complexes.

In terms of deciding which of the three commercialization routes to pursue, Hockaday describes it "as the art of the possible"—the market will determine what can be achieved.[11] Isis reviews approximately 150 "new invention disclosures" per year,[12] and overall, Isis has deftly used the three forms of commercialization to produce impressive results. Since 1997, Isis has been responsible for more than 200 licensing agreements, the creation of 57 spin-out companies (including Oxonica Materials plc, highlighted in Section 5.3), and several materials agreements.

There have been two phases in the short history of Isis. The first phase began in 1987, when the British government transferred the rights to university research away from an

organization called National Research and Development Corp. (now called the British Technology Group) and into the hands of the universities themselves (as mentioned earlier). Hockaday notes that "the Conservative government [led by Margaret Thatcher] was very keen to create a climate to stimulate venture capital," and this government impetus coalesced with universities' increasing interest in commercializing the fruits of their labor.[13]

Despite this favorable climate, Isis received minimal University support from 1987 to 1997. Isis had three employees during this time, and essentially covered its costs based on revenues of £300,000 per year from the Oxford Innovation Society. The Oxford Innovation Society, founded in 1990 to enable industrial companies to have a "window" on scientific developments, was able to generate revenue as a matchmaking service between industry and the University.

The second phase of Isis runs from 1997 to the present. Over the course of these years, Oxford has seized the opportunity of commercializing research in a prudent manner by gradually increasing its funding of Isis. With respect to profitability, Tim Cook, Deputy Chairman of Isis, comments, "I think the University got back [over the past 10 years] about ten times what [it] invested. Funding Isis is a good thing for the University to do."[14]

Hockaday explained in a US Library of Congress presentation that the main objective of Isis "is to transfer technology out of the university into industry, and … in light of our base of research at Oxford, [to] make money while doing so."[15] The results are strikingly apparent: in 2006 alone, Isis filed 57 new priority patent applications, adding to a portfolio of over 400 "patent families" (the international patents that derive from the first priority filing). Isis also concluded 7 material agreements in 2006, and launched six spin-outs.

Today, other universities across England have followed Oxford's example by starting similar technology transfer offices[‡] to commercialize their research. These offices, like Isis, endeavor to ensure an equitable outcome for the researchers, the university, and outside investors.

[‡] These organizations are sometimes referred to as a "Technology Licensing Office" or "University-Industry Liaison Office."

5.1 Ideas and opportunities

The starting point to consider converting an "idea" into an "opportunity" is when a researcher—and, indeed, any entrepreneur—has a patentable and unique discovery that meets a need in society. This process, known as commercialization, will be successful when supported by an "entrepreneurial culture," an effective technology transfer mechanism, and endorsement from professional and financial advisors.

Every new venture starts with a kernel: an idea. The idea may involve a new way of delivering a service or manufacturing goods, or it may advance the field of medicine. While this chapter focuses on ideas generated by Oxford researchers, the processes discussed—which separate the wheat from the chaff and prepare start-ups to wrestle with the challenges of a fast-moving marketplace—apply to the entrepreneurial process generally.

In the Oxford context, researchers explore unique aspects of the life sciences, physical sciences, social sciences, and humanities. All research output in these various fields of inquiry must undergo a careful and painstaking analysis to determine if it has any possible commercial benefit. Examiners ask a basic question: Can any of this research be converted to a product that consumers will pay for?

Entrepreneurial writings are rife with discussions that highlight the need to distinguish between ideas and opportunities.[16] An "idea" is a discovery or invention with unknown potential, while an "opportunity" is something that, upon due diligence, demonstrates a reasonable likelihood of undergoing successful commercialization. As noted earlier, not every bit of great research is an opportunity: a novel and very interesting discovery may be of no value in the marketplace.

With that in mind, the first step in an idea's successful exploitation—whether through licensing, a spin-out, or material sales—is to patent the idea. This method of legally protecting an invention is the basis for a competitive advantage in the marketplace (though it does not guarantee success). The key concept underlying patent law in both the UK and the US is that legal protection is granted for a novel way of doing something.[17] According to the US Patent and Trademark Office, Utility patents (which would apply to the present discussion) "may be granted to anyone who invents or discovers any new and useful process, machine, article of manufacture, or composition of matter, or any new and useful improvement thereof."[18] Thus, determining whether or not an idea is patentable provides a starting point for deciding if the researcher's product is unique and fills a need in the marketplace. Another litmus test is to estimate an idea's commercial value based on its exclusivity: is it one of the only ways to accomplish a certain task?

Based on such considerations, technology transfer offices will decide which ideas to develop further. Along those lines, Larry Farrell (featured in Chapter 3) stresses that an entrepreneur's foremost concern should be his venture's consumer appeal: who will buy the product, and why? In other words, patentability reflects potential success by highlighting the strength (or weakness) of the link between the product and the consumer.

Isis works closely with the Research Services Department of the University, and all grants and contracts go through that office. From there, Hockaday and his multidisciplinary team at Isis work with researchers to decide if the researchers' advancements are capable of commercialization. In fact, Hockaday's main goal is to identify discoveries or inventions that will have market appeal. However, based out of a university context, Isis's policy is also to

bring a wide range of research successfully to the market—not just the research that will presumably generate the greatest return (which, in any event, would be difficult to determine at an early juncture).

So, in view of the challenges outlined, how does Isis create an infrastructure among stakeholders that can support the process of commercializing University research output? Isis has developed three structural elements that assist researchers involved with its program.[19] First, Isis strives to maintain a "university entrepreneur culture," challenging the entire Oxford community to see the practical value of research for the marketplace. Isis encourages researchers to not only pursue research, but also to make it available to a much broader community. The University entrepreneurial culture manifests itself through Isis's economic incentives, which are given for expended effort in fields of research with clear commercial applications.

Secondly, Isis seeks to provide Oxford's researchers with an effective technology transfer mechanism. Just as Isis must have confidence in the quality of Oxford's researchers, so also the researchers must believe that Isis can give their ideas the best possible chance of commercialization. Therefore a critical and final component of infrastructure for successful commercialization is the endorsement of external parties. To that end, Isis attempts to connect researchers with the business community; unless external financiers are prepared to invest in the research, the commercialization effort is for naught. All three aspects of the identified infrastructure are necessary for successfully taking an idea and turning it into an opportunity.

5.2 Guidelines for successfully starting a new venture (a spin-out)

The successful commercialization of research by way of a spin-out requires committed and sustained effort by the researcher, and demands a range of services from Isis. Moreover, the researcher must work cooperatively with Isis and other stakeholders in order to overcome inevitable challenges.

Cigarette packs have a prominent label indicating that the product inside may cause cancer and have other ill effects. Similarly, Isis's guideline booklet called "Starting a Spin-out Company" ("Spin-out Guide") offers a "health warning" for those interested in tackling the process of commercialization:

> Setting up a spin-out is a stressful activity and will distract you from your research. You will need to work with business managers and investors whose objectives may be very different from your own.[20]

Isis devotes considerable resources to each particular opportunity it assesses and therefore does not wish to proceed down the arduous path to commercialization if the researcher is not fully committed. This is comparable to any entrepreneurial venture: if the founder does not truly believe in the start-up's potential, then there is limited scope for success. Thus, in light of the pivotal role of the researcher, Isis not only requires upfront commitment, but also facilitates ongoing motivation by ensuring that the researcher has appropriate expectations.

Furthermore, since the process of commercialization involves a range of Isis team members, researchers must be able to work well with other people. Hockaday understands that researchers and market-driven advisors have very different mindsets, and notes that researchers must be willing to adapt accordingly.

Hockaday describes many of the academic people he works with as extremely focused: "They are brilliant researchers, because they set out on a path to do really good research in a

university context."[21] These individuals likely decided early in their careers that the university was their "preferred working environment," and they found success by following the conventional path within that environment.[22] Hockaday explains, "People succeed in [the university context] by doing good research, publishing good research, being thorough, and being meticulous. They generally climb up the university promotions ladder through very high quality publications and [strong] teaching."[23]

These personal habits and skills cultivate excellent ideas, but often bog down the process of commercialization. Hockaday sums up the essential dilemma, stating, "The challenge is that you have technologies and research outputs developed by brilliant researchers on the one hand, and you have the business world on the other hand. You then have to integrate people from each environment with one another."[24] This is a quintessential entrepreneurial dilemma when bringing new technologies to market: researchers and inventors are rarely able to successfully commercialize their own products. Thus, both the researchers and the facilitators of commercialization must embrace the challenge of working together. Unfortunately, because of the striking differences between entrepreneurial and academic mindsets, researchers may be frustrated that (as Hockaday said in his warning) they are working with "business managers and investors whose objectives may be very different from [their] own."[25]

Tim Cook, mentioned earlier in the chapter, provides another perspective on working with researchers. He notes, "Commercialization will only work if academics want to do it."[26] According to his observations, Isis deems a project attractive only if it is "a function of the strength of the science" and the academic is co-operative in the commercialization process.[27]

This may seem odd, but anyone with entrepreneurial experience knows that the negative disposition of a key inventor or researcher can undermine even the most promising products.

As markers for whether or not Isis should enter into time-intensive, complex, and stressful undertakings with specific researchers, Cook asks some basic questions about the researchers' personalities: "Do they turn up on time for meetings? Do they have any embarrassing personal characteristics that will alienate licensees [or investors]? Do they want to work with us?"[28] These questions reveal critical character strengths or flaws in the researcher.

Clearly, Isis cannot be in the position of a motivator—that would be a counterproductive undertaking. Instead, the researcher must be powerfully self-motivated to see the product in the market. So how does Cook assess determination? He states, "We work with the ones who choose to come to Isis, finding their own tortuous way in. Our method gives us a self-selecting sample of the kind of people we want to work with."[29] Though Isis makes "noise all the time" in the University community, Cook emphasizes, "We generate a lot of interest, but only deal with those researchers who come to us."[30]

Hockaday echoes this approach when he discusses pathways of commercialization with researchers. He paints a very realistic picture of the challenges of the process, and secures the full, informed commitment of the researcher before embarking. Obviously, this is not a matter of Hockaday trying to convince or cajole the researcher into becoming involved in the commercialization process. On the contrary, Hockaday sometimes confronts researchers with the harsh reality that they are entering an entirely different sphere than the research environment.

Once Isis decides to commercialize a particular piece of research, and a spin-out is determined to be the preferred route, it contributes in three practical ways. First, Isis assists with preparing a business plan, which is the primary reference point for investors who are deciding

whether or not to fund a new venture. When crafting the business plan, Isis works toward a consensus with the researcher on core issues such as the method of financing, corporate strategies, and securing key personnel. Therefore the business plan reflects the joint position of Isis and the researcher, and it forms the foundation of the spin-out.

While some leading entrepreneurship writers believe principals should write their own business plans and minimize external help,[31] Isis works as a co-collaborator in birthing the strategy of the spin-out and demonstrating the potential of the product, so its direct involvement in the business plan is logical. Moreover, since an industry rule of thumb is that only 1 – 3% of all business plans successfully lead to an investment, the assistance of an experienced consultant/advisor can improve the odds for a fledgling spin-out company. Isis has a highly impressive track record of success, as only 3 of 57 spin-outs over a 10 year period have filed for bankruptcy.

The Spin-out Guide describes the practical nuances of preparing a business plan for Oxford researchers, and these insights apply equally to most new ventures. One of the first considerations is whether or not meaningful financial projections can be prepared. While investors want to determine the possible return, a business may be at such an early stage that worthwhile calculations are not feasible. As the Spin-out Guide notes, "In these cases the investment decision will be made on the basis of confidence in the researchers, proposed spin-out managers, and the technology."[32]

The Spin-out Guide further states that the business plan will evolve as new facts and ideas emerge; moreover, various stakeholders may have sensible input in fine-tuning strategy, and this will result in revised financial projections. Thus, from a practical standpoint, any initial contact with investors may focus primarily on an executive summary—as short as one page in

length—to initiate discussion, with the common understanding that a working relationship will result in a review of the company's strategic plan.

In addition to assisting the researcher with a business plan, Isis helps develop the organizational structure and strategy of the spin-out. The researcher and his product are at the core of this procedure. The Spin-out Guide states, "It is important that the team has a leader."[33] Though this comment may seem simplistic, it stems from experience: many researchers are clever inventors, yet not effective company leaders. And, while other parties may become involved, they will not take on primary leadership because they are not inventors of the product. Thus, Isis must ensure that the researcher is a team-oriented leader, and also that this individual is surrounded by a group with complementary skill-sets.

Then, Isis helps the researcher raise funds for the new venture. Before approaching financing sources, Isis must properly set and manage the expectations of researchers. Isis educates researchers that, regardless of how promising a new idea seems, investors view a spin-out as a high risk venture requiring a commensurate return.

Isis scours a wide range of financing sources: bank loans, angels (wealthy individuals who invest in high-potential, usually early stage, ventures), venture capitalists, seed capitalists, institutional capitalists, and corporate venturing capitalists. Venture capitalists, a common source of financing, provide insight into the challenges of securing financing for a spin-out (which, by definition, has no revenue and no corporate track record). Venture capitalists look at hundreds of plans, but invest in few companies. And, despite all their experience and exhaustive due diligence, even when they do invest, the majority of new ventures fail.

Venture capitalists desire any single venture to show a return of 10-20 times the initial investment, to balance losses on their other ventures. Consequently, to increase the potential for

success, a venture capitalist will often take on some level of active involvement in the spin-out. In that case, the researcher must recognize the venture capitalist's contribution to the spin-out and work cooperatively. Stated simply, securing a financial investment from a venture capitalist is a daunting task; moreover, the funds are always accompanied by conditions that give the venture capitalist input into the strategic direction of the company. As a result, Hockaday's advice to spin-out companies is to secure the initial seed rounds of investment from business angels (wealthy private investors, typically with their own entrepreneurial experience) rather than venture capitalists. Hockaday has discovered that venture capitalists find the initial round too risky to satisfy their investment criteria (they are managing a pool of funds under strict investment criteria), whereas business angels (who are investing their own funds) view the risk differently.[34]

Another basic issue when starting a spin-out, or any new venture for that matter, is to determine how to divvy the ownership of the company. How should the pie be divided between the researcher, Isis, and investors (such as venture capitalists)? The Spin-out Guide provides a guideline in the form of a "Share Dilution Chart."

The researcher's contribution is fundamental; however, as we have seen, it is merely a starting point. The challenge when dealing with researchers (or inventors) is that they are likely to overemphasize the value of their own contributions. However, Isis explains to them that, based on risk and investment, an equal division of equity between the researcher and Oxford is a fair proposition. Isis's objective is to make the project a success—and that means Oxford has to benefit along with the researcher in order to make its contributions sustainable and financially worthwhile for the University.

The Spin-out Guide clarifies the rationale behind Isis's expectation that Oxford should be an equal shareholder with the founder researchers:

> There are a number of factors to be taken into account: for example, the roles of the individual researchers, the amount of capital required, the involvement of the University in reaching the stage where a spin-out is possible, and the importance of the association with the University.[35]

The Spin-out Guide further states that "the division of spin-out equity between all those involved and the management and employees is a key issue and must be addressed early in the procedure."[36] Again, Isis must be proactive in setting reasonable expectations before it devotes resources to the pursuit of commercialization.

Once the University and the researcher agree on the conditions of respective ownership, they can then determine what percentage of the company to sell to investors. As the Share Dilution Chart below indicates, an investor may dilute the respective ownership of the researcher and Isis from 50% to 33% each. The investor, however, is providing critical funds to drive the process forward. Of course, an investor with a lot of leverage (perhaps the spin-out is desperately short of cash) may require the University or the researcher, or both, to reduce shareholder percentages below 33%.

Also, as the Share Dilution Chart demonstrates, when a company raises more funds (such as in "Stage 3" below), it issues more shares and reduces the percentage ownership of the original shareholders even further. Needless to say, the longer it takes for a spin-out to become financially self-sustaining—and thus the more outside financing is necessary—the more ongoing dilution to the shareholding of Isis and the researcher will occur.

SHARE DILUTION CHART			
	Stage 1	Stage 2	Stage 3

	shares	%	Shares	%	shares	%
Founders	50	50	50	33.3	50	29.4
University	50	50	50	33.3	50	29.4
Investors			50	33.3	50	29.4
Management					20	11.8
Shares	100		150		170	
%		100		100		100

SOURCE: Spin-out Guide, 10.

In many ways, the process Isis proposes for researchers who want to launch a new venture is similar to the entrepreneurial journey for inventors with little or no business experience. These researchers or inventors may have created something of value, but they cannot successfully set up a company without help. For Oxford researchers, Isis provides all the necessary start-up services through one vehicle; for most entrepreneurs, however, these services must be gleaned from a variety of sources. In such a case, the lessons from Isis's methods of operation provide important information for any inventor who wishes to commercialize an invention.

The Spin-out Guide emphasizes four realities for researchers, which also have value for inexperienced entrepreneurs. First, a researcher must devote considerable time to the venture, and this may be time that the researcher would prefer to spend on research. Second, external skill and resources must be secured. Third, the researcher must engage in much "mundane work" (i.e. meetings, presentations, correspondence and phone calls). Finally, a "measure of luck" is required—as Hockaday explains, "You can do everything perfectly and still fail."[37]

Unknown competitors may arise, or market demand may shift. The synergy of a talented team may fall into dissension; investors may have a personality clash with the researcher-

founder. Hockaday jests that "an interplanetary alignment" is needed to facilitate success. The following section illustrates the actual challenges faced by an Isis spin-out.

5.3 Growing & financing a new venture—Oxonica Materials plc[§]

The successful development of a start-up venture requires careful and flexible strategic planning, bootstrapping skills, determination and persistence, the support and resources of financiers, committed leadership, and a focus on long-term value creation.

The chapter thus far has emphasized the challenges of moving from an idea to successful commercialization. As well, Section 5.2 highlighted some of the significant issues related to starting a spin-out, including the crucial step of securing financial support. To understand these fundamental guidelines in greater detail, I will focus on one spin-out company launched by Isis: Oxonica Materials plc ("Oxonica").[**] Oxonica owns patented properties in an important industry, has achieved significant milestones over its first ten years of operation, and is a well-regarded company in its field. And yet the path to its present level of success was fraught with peril and near-death experiences.

Nanox Limited, which has since become Oxonica, was founded in 1998. The company began with Professor Peter Dobson and Dr. Gareth Wakefield, both engineering researchers in the field of nanotechnology. (The Foresight Nanotech Institute of Palo Alto, CA, states that "the definition [of nanotechnology] most frequently used by government and industry involves structures, devices, and systems having novel properties and functions due to the arrangement of their atoms on the 1 to 100 nanometer scale."[38]) Prof. Dobson, who is internationally recognized in the field of nanotechnology and is the Academic Director of the Begbroke Science Park (which includes the University of Oxford's Institute of Advanced Materials), advised the Oxonics Group (as it was

[§] Editor's Note: to clarify, as per my "Author's Note" at the start of this chapter, that this summary of Oxonica is prepared by myself; other than Hockaday informing me of the company, none of the comments in this section should by attributed to him.

[**] The abbreviation "plc" stands for "public limited company" and is equivalent to the US abbreviation "Ltd." for "Limited."

then known) under a consultancy agreement, in connection with the development of nanoparticles.

Dr. Wakefield, who now leads the group's research activities, began working on novel nanomaterial systems at Oxford in 1994, which led to the development of some of the core intellectual property of Oxonica (as it is now known). Since then, Dr. Wakefield has published extensively in the area of nanotechnology. Oxonica has maintained a close relationship with Oxford, which provides access to specialized equipment, highly qualified technical personnel, potential customers, and partners. Moreover, the head office of Oxonica remains in Oxford.

Oxonica's original aim was to develop and market phosphor technology for field emission displays; in fact, the company raised about £750,000 for that purpose.[39] After 12 months, however, commercial realities revealed that the phosphor market was largely controlled in the Far East, and that the displays market had too many competing technologies. As a result, Oxonica changed direction and stopped marketing field emission systems. Unfortunately, however, most of the company's £750,000 had been spent by that time. After only three years in existence, Oxonica was in serious trouble: it needed to expand its technological base, clarify its strategic direction, and refocus its management team.

In the year 2000, Oxonica secured £100,000 through an angel finance round. A year later (April 2001), the company hired Dr. Kevin Matthews as its full-time CEO. In light of the failed foray into the phosphor market, Matthews had to assess the situation quickly. He remembers:

> My challenges as CEO were to refocus a large operational board into a strategic body focused on ensuring that the company remained funded, kept a clear direction, and had the appropriate policies and reporting in place; and, also, to convert a business with low morale and no real product focus—lots of research but no real commercial focus—into a dynamic successful team.[40]

And all of this with no money. Matthews recalls, "The biggest risk for me was that when I joined Oxonica, it had only eight weeks' cash left."[41] Of course, as with any entrepreneurial venture, cash flow is oxygen—and it is vitally important when the company is not yet in a profit-making position. The issue is always whether or not there is enough cash to get to the break-even point, when the product can finally get to the market and be accepted at a reasonable price. Thankfully, in Matthews' case, some pre-work had been done prior to his arrival. He marketed the company to investors as soon as he was hired as CEO and was able to complete a third angel round that raised £540,000.

Matthews came to three immediate conclusions. First, he realized, "Oxonica had to focus on some commercial opportunities very quickly. We could not continue burning money as a research house [that] still had a 'university' approach." One of his challenges was to get the researchers not to focus on the process but rather on the commercial viability of the output (this issue was mentioned in Section 5.2.). A second revolutionary change was to alter the focus of the board—away from the previously-adopted initiatives, and toward the new direction he believed was vital to Oxonica's survival.

Third, Matthews felt the ever-present concern of any company that is burning cash—the desperate need for survival. During that time, Matthews understood, "We must soon raise a substantial amount of cash, to allow us to develop a real business. Since people are in business to make money, anything else is pretending—as a prelude to hoped-for profitability."[42] One particular hurdle was that in the field of material sciences, as opposed to the field of software development, a substantial amount of cash is necessary. The board realized that £540,000 would only last through 2001.

At this early juncture, Matthews was already trying to position the company for an eventual listing of its shares on a public stock exchange. A keen eye to positioning the company in the mind of venture capitalists and investment houses was critical in terms of present and future value creation, because a company will be valued differently depending upon its marketplace categorization.

Knowing this fact, Matthews decided to focus on fuel-saving technology and sunscreen technology; he believed these fields could be labeled under "specialty chemicals" and given an appropriate price-earnings ratio. He also wanted to keep the company's bio-diagnostic activity alive in order to balance the company's portfolio.

Oxonica launched a new venture capital financing only two days before the September 11th terrorist attacks on New York City (in 2001). The devastation reverberated in financial markets worldwide. Matthews' response was to persist, and to throw the net as wide as possible:

> In the event, about 90 venture capital groups reviewed our business plan. I met with some 55 of them, 36 twice, and all that activity coalesced to a single term sheet. Despite all the interest from venture capital groups, only one wanted to lead our financing.[43]

How did the company survive in the meantime? The answer, in blunt terms: with very little cash on hand. Oxonica finished 2001 with £40,000. Matthews describes, "Our burn rate was still £80,000 a month, but we'd already taken action to generate cash, and we were able to continue until June 2002 without further capital-raising."[44] As with any entrepreneurial venture, this one required bootstrapping at its best in order to make ends meet. Oxonica obtained cash from taking a small loan, doing contract work, and using a government Research & Development tax credit. Thus, Oxonica was able to survive just long enough to close the venture capital round with large multinationals who were interested in the material sciences space.

Matthews summarizes the end result: "The lead was taken by VCF Partners, a UK fund representing two Venture Capital Trusts (VCTs),[††] Trivest, and Foresight. Northern Venture Managers came in, as did Generics Asset Management, [both] solid groups of investors with capacity to [finance further rounds]."[45] The June 2002 financing raised £4.2 million, taking the company through its most significant financial challenge. Thereafter, in early 2004, the company raised a further £4 million through a rights offering (an offering of shares to existing shareholders).

In July 2005, Oxonica was floated (i.e. listed) on the Alternate Investment Market (AIM) of the London Stock Exchange (trading symbol OXN), raising £7.1 million at 125p (pence) per share. Up to the time of the listing, Oxonica had raised a total of £12.5 million, including the founding investments and angel rounds.

The challenge for every entrepreneurial venture is not only to get financing, but also to obtain those funds from the most suitable partners. As Section 5.2 points out, a spin-out company must cooperate with a number of stakeholders, including investors who will often become involved in the strategic direction of the company. Oxonica was able to attract large, credible venture capitalists with a great track record who also had the capacity to do ongoing rounds of financing. In addition, these types of venture capitalists can garner specialized expertise and connections in the particular industry. Oxonica illustrates that "smart money" does not just fall into a company's lap: entrepreneurs have to work hard for it.

Once Oxonica was able to achieve financial stability, it had the means to begin building its business and capitalizing on its patented research. In 2005, Oxonica had gross revenue of

[††] Venture Capital Trusts are "quoted limited companies whose purpose is to invest shareholders' funds in smaller unquoted trading companies, (including AIM listed stocks) having potential for growth, with a view to mak[e] profits. Most VCTs are run by investment managers and raise their funds from private investors." (http://www.is4profit.com/is4money/savings-investments/venture-capital-trusts.html)

£1.2 million. Then in July 2006, Oxonica signed an initial supply agreement with Petrol Olisi A.S., Turkey's leading national oil company, for Oxonica's Envirox™ fuel-borne catalyst. The agreement resulted in £7.6 million of additional revenues for the year. Another positive development in 2006 was the signing of a license and collaboration agreement with Beckton Dickinson & Co. (a leading global medical technology company) for Oxonica's proprietary Nanoplex™ technology in the in-vitro clinical diagnostics market. As part of the agreement, Beckton Dickinson invested US$2 million in ordinary shares of Oxonica. Together, these agreements increased Oxonica's 2006 gross revenue to £10.2 million.

As noted, Oxonica has overcome a number of obstacles throughout its ten-year history, illustrating the many challenges faced by start-up companies. However, it is now a relatively stable company with 60 employees and 3 locations: Oxford (31), focused on energy and materials; Mountain View, CA (27), concentrated on healthcare and security; and Singapore (2), working on energy.[46] Oxonica has a significant base of revenue and has entered into contracts that affirm its current strategic direction. While Oxonica will no doubt face additional hurdles as it strives for continued growth, the Company has already achieved many entrepreneurial milestones.

5.4 The lessons of technology transfer

There are three main lessons with respect to the commercialization process: (1) set and maintain the proper focus; (2) confront the challenge of raising money; and (3) do not underestimate the obstacles you will face along the way.

This chapter has detailed the process of taking an idea from its initial stage to its successful commercialization. We have discussed the Oxford environment and the distinction between an idea and an opportunity, and we have examined a spin-out called Oxonica to highlight potential difficulties barring entrepreneurial success. In conclusion, I would like to highlight three lessons Hockaday offers with respect to technology transfer:

First, launching a successful new venture requires a clear strategy for breaking into intended markets. Hockaday notes that "a characteristic of early stage companies is often the breadth of the offering."[47] There may be many potential applications for a new, patented technology, but which one can yield the greatest chance for commercial success? The company must determine the application that has the greatest potential for success, and then pursue it with a keen focus.

So, which opportunity should be focused on? Hockaday challenges the company's leadership: "You have to do a lot of market analysis of a technology that will only be ready in a few years, to a marketplace that will only be there for a few years."[48] Such a prediction seems almost as abstract as the prophecies of a soothsayer; yet, increased wisdom comes with experience. In order to be successful, a company must focus on a specific and carefully selected market.

Then, a company must raise funds. Hockaday forces researchers to answer the following question: "You're asking other people to spend their money on your ideas—why should they?"[49]

All entrepreneurs looking for money need to ask themselves that same question. While researchers and entrepreneurs may envision sugar plums and vast riches, financiers are more practical. Hockaday notes that when financiers consider making an investment, they have to make an opportunity decision (choosing one technology over another), and then they have to invest in the concept's long-term development to bring it to market.

Thus, researchers and entrepreneurs need to have a well-constructed and diligently researched response to Hockaday's question. They must move beyond a simple "it might make money and make the world a better place" pitch to financiers, and instead present a compelling value proposition for a unique product.[50] A great idea will generate some interest (this is the "sizzle"), but only the underlying research and due diligence (the "steak") can secure an investment.

Once interest is established, Isis works with the investors and researcher(s) to negotiate the terms and conditions of the investment. In Hockaday's experience, investors often require "warranties and guarantees, and they want the whole deal sewn up so that, if it fails, they get their money back, roughly speaking."[51] Hockaday appreciates the motivation behind these high expectations, but, on behalf of Isis and the researchers, he tells investors, "It doesn't work like that."[52] Ironically, Hockaday not only educates the inventors of a product; he also has to set the expectations of financiers. He explains, "It is not realistic to expect a university researcher to get involved in making promises and guarantees about whether a very early stage technology company is going to succeed in the marketplace."[53]

Another main lesson for a start-up company is that the challenges of the commercialization process cannot be underestimated. Oxonica is a case in point. Kevin Matthews of Oxonica reflects, "When you are trying to introduce a new product technology, the

number of hurdles you must jump is high. So you have to motivate the team and keep them driving forward in the face of the odds."[54] Section 5.2 highlighted the range of challenging issues to be addressed while on the path toward successful commercialization.

Hockaday blames "the sheer gulf between the outputs of university research and what is needed in the business world" for the intensity of this issue.[55] As part educator, commercialization tutor, and mentor, preparing researchers for the road ahead, Hockaday and his team are quite familiar with entrepreneurial obstacles. In most instances, he will be the first one to explain the commercialization process. And, for the inexperienced, he repeats one of his most common sayings: "You don't make money out of technology—you make money out of a business that successfully commercializes technology."[56]

For Hockaday, working with world-class researchers is a rewarding process; getting paid to do so is a bonus. As he ponders the results of the efforts of the entire Isis team, he can spot a collection of champagne corks neatly placed on a small rack in the bookshelf at his Isis office. Hockaday explains:

> when we launch a new spin-out company we organize a 'completion' meeting where all the documents are signed off and the investors sign their cheques to finance the business. The University becomes a shareholder [and not Isis directly], so all we are left with is the cork from the champagne everyone drinks--and the satisfaction of launching a strong new technology business.[57]

Hockaday is looking forward to collecting many more corks in the future.

Hockaday's key points

5.1 – The starting point to consider converting an "idea" into an "opportunity" is when a researcher—and, indeed, any entrepreneur—has a patentable and unique discovery that meets a need in society. This process, known as commercialization, will be successful when supported by an "entrepreneurial culture," an effective technology transfer mechanism, and endorsement from professional and financial advisors.

5.2 – The successful commercialization of research by way of a spin-out requires committed and sustained effort by the researcher, and demands a range of services from Isis. Moreover, the researcher must work cooperatively with Isis and other stakeholders in order to overcome inevitable challenges.

5.3 – The successful development of a start-up venture requires careful and flexible strategic planning, bootstrapping skills, determination and persistence, the support and resources of financiers, committed leadership, and a focus on long-term value creation.

5.4 – There are three main lessons with respect to the commercialization process: (1) set and maintain the proper focus; (2) confront the challenge of raising money; and (3) do not underestimate the obstacles you will face along the way.

Endnotes

See Bibliography for more information about any of the sources listed.

See Appendix C for more information about any interview listed. All interviews conducted by Richard Goossen.

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[1] Attributed to Ralph Waldo Emerson, philosopher and poet (1803-1882).
[2] Dwek, Commercializing University Research.
[3] Oxford UP website: http://www.oup.com/about/history/
[4] Isis, Starting a Spin-out, 3.
[5] Stanislaw & Yergin, *Commanding Heights*, 105-113.
[6] Interview with Tom Hockaday by telephone, June 11, 2007. ("Hockaday Interview #1")
[7] Hockaday Interview #1.
[8] See www.isis-innovation.com.
[9] Isis Innovation, *PowerPoint Presentation*.
[10] See www.isis-innovation.com.
[11] Interview with Tom Hockaday, July 16, 2007, Oxford, England ("Hockaday Interview #2")
[12] Hockaday Interview #2.
[13] Hockaday Interview #1.
[14] Tim Cook, Isis Innovation, *Oxford Science Enterprise Centre Newsletter*.
[15] Hockaday, T., et al, Commercializing University Research.
[16] See, for example, Barringer, B. R., & Ireland, R. D. (2007), *Entrepreneurship: Successfully Launching New Ventures* (2nd Ed). Upper Saddle River, NJ: Pearson Prentice Hall, 39.
[17] While the basic premise of patent law in the US and the UK is the same—the protection of an invention for a specified period of exploitation by the originator—there are some significant differences. The Isis booklet titled *Guidelines to Researchers[:] Intellectual Property, Patents and Licences* notes: "Patent provisions in the USA are different (they operate a first to invent system, rather than the first to file system), and if the invention has been disclosed, Isis and its patent attorneys will advise as to whether it is still possible for the valid patent protection [ion the UK] to be secured in the USA." (6). The guide points out another distinction: "In the majority of countries patent applications are published 18 months after they are filed. US patents are not published until they grant – which may be many (2 – 15) years after filing." (7)
[18] "General Information Concerning Patents (Revised January 2005)." US Patent and Trademark Office. http://www.uspto.gov/web/offices/pac/doc/general/index.html
[19] Isis Innovation, *PowerPoint Presentation*
[20] Hockaday, Starting a Spin-out, 3.
[21] Hockaday Interview #1.
[22] Ibid.
[23] Ibid.
[24] Ibid.
[25] Hockaday, Starting a Spin-out, 3.
[26] Tim Cook, Isis Innovation, *Oxford Science Enterprise Centre Newsletter*.
[27] Ibid.
[28] Ibid.
[29] Ibid.
[30] Ibid.

[31] In *New Venture Creation* (7th ed), 227, author Jeff Timmons (featured in Chapter 11) notes that there are good reasons why "outside professionals" should not write the business plan.
[32] Isis, Starting a Spin-out, 6.
[33] Ibid., 4.
[34] Hockaday Interview #2.
[35] Ibid., 5.
[36] Ibid.
[37] Hockaday Interview #2.

[38] Foresight Nanotech Institute. http://www.foresight.org/nano/whatisnano.html. The site also explains: "Many fields of endeavor contribute to nanotechnology, including molecular physics, materials science, chemistry, biology, computer science, electrical engineering, and mechanical engineering. Due to the extreme breadth and generality of this definition, many prefer to use the term 'nanotechnologies.' For clarity, it is also useful to differentiate between near-term and long-term prospects, or to segment the field into first-generation through fourth-generation stages."

[39] Dr. Kevin Matthews, Oxonica. *Oxford Science Enterprise Centre Newsletter.*
[40] Matthews Interview.
[41] Ibid.
[42] Ibid.
[43] Ibid.
[44] Ibid.
[45] Ibid.
[46] Commercial Solutions from Nanotechnology, *PowerPoint Presentation*.
[47] Hockaday Interview #1.
[48] Ibid.
[49] Ibid.
[50] Ibid.
[51] Ibid.
[52] Ibid.
[53] Ibid.
[54] Matthews Interview.
[55] Ibid.
[56] Hockaday Interview #1.
[57] Hockaday Interview #2.