FINANCIAL TIMES

What companies can learn from a Cambridge physics laboratory

Ernest Rutherford's pioneering science lab offers great lessons in modern teamwork

Ernest Rutherford, centre, with colleagues at the Rutherford laboratory in Cambridge © Hulton-Deutsch Collection/Corbis/Getty

David Bodanis Thursday, January 16

It's hard to guide teams. Too hands-off and the result is chaos; too hands-on and no one has any space for initiative. But how to get it right? I have found the history of science an excellent way to begin.

Back in the early 20th century, when Ernest Rutherford ran the Cavendish physics laboratory at Cambridge university, he created teams that surpassed almost anything else in the world.

The Cavendish was at that time a small operation, but in a single 20-year period, researchers under his direction won at least eight Nobel Prizes in physics: more than all of France, all of Italy, and all of Japan combined. This was unprecedented.

How did he do it? Many labs had bright students and experienced professors. The twist was a particular style of guidance Rutherford brought in.

Directives at the right level

If Rutherford had given everyone at his lab very abstract guidelines, such as "be the best", that wouldn't have helped. Who doesn't want to be the best? Like vapid mission statements, it doesn't tell you anything about how to get to the desired goal.

If, on the other hand, he had specified exactly what experiments people were to do — if he had told new hires to "take this specific electrical apparatus and do precisely this operation with it, and don't argue about it" — he would have crushed their initiative. There would be no space for creativity. They would be mere technicians.

Instead, Rutherford created a guide that was in-between: not so abstract as to be useless, but not so detailed as to be unduly limiting.

Naming the guidance: mid-level abstraction (MLA)

In the case of the Cavendish lab, Rutherford's guide came out as: "See what's inside the atom." Newcomers knew what to do. Established researchers, support staff and funders did too.

Hans Geiger, for example, created his eponymous counter following this guidance, with little supervision. Out of the range of all possible actions, he knew which subset he should aim to help: it was anything that helped the teams hear what was happening inside an atom — which led to his counter with its famous "clicks".

Rutherford's work might be considered just a curio from the history of science. But successful businesses end up working in accord with skilfully cast MLAs almost all the time.

Consider Pixar. Its founders wouldn't have achieved much if their only guidance had been: "Let's revolutionise Hollywood." That's too abstract. If on the other hand they had said, "let's make movies about living toys, with a Tom Hanks-voiced cowboy as hero", they might have succeeded with one series, but that would have been it.

Pixar's Toy Story. The company's mid-level guide was: 'Tell good stories using new animation tools' © Pixar Animation Studios/Walt Disney Pictures/Snap/Shutterstock

The Pixar founders, however, knew that a fresh field was opening up with advances in computer graphics and saw a fulfilling and potentially lucrative way to use it. Everyone at Pixar in its early days, even those with no experience, instantly picked up on their distinctive mid-level guide: "Tell good stories using new animation tools."

MLA sounds easy, but many companies get it wrong. Their guides are too amorphous, or they pull in too many directions, or they fall woefully out of date (as with Yahoo). Individual charisma isn't enough, but has to be channelled.

The inner structure of MLAs

To create guidance tools pitched at the right level — getting teams to pull together, yet also keeping individual initiative — the first step is to understand how the best MLAs work.

First of all they are built around verbs. In the Pixar example, the company would be telling stories. At the Cavendish lab, the focus was on seeing what's inside an atom.

Then, along with having such verbs, good MLAs need to exclude things. Woolly compromise is out. (It's a basic point from information theory: If anything goes, there is no information; no useful advice.) It's the same reason a mentor who constantly says "Yes, go for it!" is useless. The mentee is not being given any guidance.

Pixar's guide did this very well. Conventional films were out, hand-drawn animation was out, purely technical non-story-driven exercises were out, and so on.

Rutherford's MLA at the Cavendish was similarly bold at excluding things. If researchers had been left to their own devices they might have turned to any topic of interest at the time: matters such as the improvement of undersea telegraph cables, or the precise measurement of electrical circuitry. But then they would all be pulling in different directions. There would be little of the knowledge spillovers or agglomeration effects which we know are so important in successful cities and teams today.

Nor would they have gained from the wisdom which the astute Rutherford had accumulated in his career to that point.

Sometimes game-changing MLAs arrive fully formed — think of Jeff Bezos's early efforts to "sell all books online fast". No one had to force teams to think about one-click purchasing: it was a natural consequence, like Geiger's work.

More often there is a series of iterations before getting it right, as with Google's "monetise search through targeted ads". It is also often wise to adjust for different levels within a company: corporate, departmental and so on.

There's still no magic, and one needs skill at execution. The England rugby coach Eddie Jones could be brought in to run a secondary school rugby

team, and it would still have zero chance in the World Cup. But given a minimum competency, astute MLAs do wonders.

Updating the guidance

In time, though, even the best MLAs go out of date. It happened at the Cavendish, which faded in Rutherford's later years. Only a new series of leaders, shifting focus to "investigate crystallised proteins with X-rays", reinvigorated Cambridge science: jump-starting the DNA revolution, and triggering yet another cascade of Nobels.

Companies need to refresh their MLAs as well: not too often — that's just nerves — but usually within a decade. It's hard, but not impossible. All it takes is the aptly chosen verb and confidence in deciding what to exclude.

The writer is author of 'Einstein's Greatest Mistake'