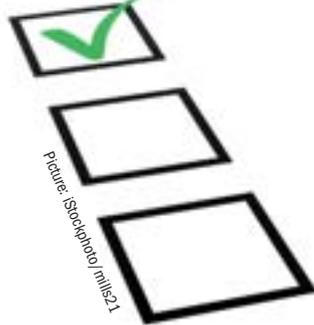


Excellent

Good

Bad



Audit: essential skills of a modern scientist

The Ideal Researcher

Helped by Deloitte Consulting, France's employment agency claims to have identified 20 skills possessed by the ideal researcher. How do you measure up?

Faced with increasing numbers of unemployed scientists and engineers, APEC, a French employment agency, decided to commission an international survey exploring "Skills and competencies needed in the research field – Objectives 2020".

The reference to 2020 is a nod to 'Europe 2020', the latest pan-European strategy for developing a "knowledge economy", this time by the year 2020. The study was conducted between May and October of 2010 by a French member firm of the Deloitte Consulting brand.

So, how did this team of management consultants set about identifying the qualities combined in that highly employable individual, 'The Ideal Researcher'?

Methodology

Basically, they interviewed 80 research managers from eight different countries, covering both the public and private sectors (45 and 35, respectively). These included researchers, directors of laboratories, university bosses, directors of human resources and government officials. Six of the countries were European (France, Germany, the

UK, the Netherlands, Switzerland and Finland), to which they predictably added the USA and Japan.

The interviews, described as "semi-directed", gathered "accounts and opinions" in response to six key questions:

1. What are the major trends in the changing organisation of research?
2. What skills and competencies are currently sought after in a researcher?
3. Which qualities are specific to experienced researchers rather than those who are just starting?
4. How well do you think these skills are



Photo: Fotolia / BlueOrange Studio

In order to develop the essential skills, it's good to start young.

Questionnaire: Are you the Ideal Researcher?

In this exercise, we are testing for the key essential qualities.

Rate your skills on a 3-point scale (see solution on page 29):

0 points - What skill? I've never thought about this before.

1 point - It's occasionally been known to happen.

2 points - I'm an expert at this.

	0	1	2
A. Scientific Skills			
A1. My computer and I are inseparable. It does exactly what I ask of it and I can even repair it. I've also tweaked programme codes. I can relate to my computer.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
A2. I have talked to researchers from other disciplines about more than just the weather.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
B. Management Skills			
B1. I can ask other researchers if they'd like to interact with me and find common ground for research.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
B2. I know how much lab supplies cost. I have a system for purchasing lab products at the best price, thereby maximising the lab's limited funding resources. I even know where to exchange our surplus with other labs if needed.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
B3. I recognise that scientific experiments are only one tiny part of a huge process that requires me to go around asking for money, work out how to spend it and finally claim to have spent it well before asking for more money again.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
B4. At social gatherings with non-scientists, I can explain why my research is important for them, their children and their children's children, although I rarely do this anymore because people stop talking to me.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
C. Personal Qualities			
C1. I am bubbling over with new ideas.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
C2. I have difficulty sleeping at night whilst preoccupied with the search for novel solutions to experimental problems. I frequently doodle my flashes of inspiration in my lab book and on envelopes, beer mats, tax returns, etc.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
C3. I often hum, whistle or tap rhythmically in the lab.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Grand Total:	A:	B:	C:

currently mastered by researchers in your country?

5. How are they likely to evolve over the next 10 years?

6. What actions and strategies do you propose to produce, attract and retain researchers?

Public turns private and the market rules

Before looking at the specific qualities of the Ideal Researcher, the report examines changes to the overall organisation of research. These have been subdivided into structural, cultural and 'new' ways of doing research.

On the structural front, everyone (except the Japanese) claimed to have increased their investment in public research and higher education budgets, often associated with national or European Union strat-

egies to identify key research themes and priorities. Meanwhile, private companies have been reorganising their research activities, notably in specialisation and externalisation, whilst public research has been encouraged to do more and more of the research previously performed in the private sector. Presented as 'factors of innovation', each country had created structures where private and public researchers can work together, for example in science and technology parks.

By 'cultural evolution' they mean changes in how researchers actually look at what they're doing in a wider context. In particular, the report notes that all research managers now take account of "the importance of markets" and "a rigorous management of expenditure".

Although this varies by country and according to the public or private nature of

the research conducted, they say it is always accompanied by:

- ▶ the necessity for the regular evaluation and approval of ongoing research ("and the associated researchers");

- ▶ the need to develop a higher education system which, beyond "excellence for itself", looks to "performance as a means of winning new markets";

- ▶ and the necessity for researchers to understand and know where to find the financial resources for their projects and to be able to adapt to "sometimes abrupt changes" in research priorities.

Desired research qualities

You've probably already guessed that 'new ways of doing research' is something of a euphemism. Yes, it's all a question of reinforcing multidisciplinary and interdisciplinary approaches. Because, according to

dogma, multidisciplinary approaches “favour research at the ‘interfaces’ between disciplines – ideal breeding grounds for new ideas”. And the “action levers” to achieve this heightened frenzy of innovation are the “financing of multi- and inter-disciplinary projects and a greater awareness of the expectations of civil society”.

So, what are the qualities that everyone looks for in a researcher? Conveniently, Deloitte found that the profile of the experienced researcher was identical in all eight countries for the needs of both public and private research.

The experienced Ideal Researcher possesses 20 qualities: six are described as ‘scientific’ and five as ‘personal’ characteristics. However, fully nine are management-related! Did the Deloitte management consultants forget that we’re talking about scientists here?

The full range of identified skills are:

Scientific: scientific knowledge; the ability to learn and adapt; the capacity to formulate a research problem; the ability to analyse and master computer skills to a high technical level; the ability to work in an interdisciplinary environment; and the capacity to integrate existing knowledge.

Personal: creativity; an open mind; motivation and involvement; adaptability; and the capacity to self-evaluate.

Management: the ability to work in a team; communication skills; the capacity to develop a network; a capacity to evaluate; language skills; an enterprise (business) culture and management skills; project management; team management and direction; and the ability to take account of the relevance of one’s research and its impact on the environment.

Just starting out?

However, the job of a researcher is changing fast. Of these 20 qualities, only six were identified as being critical during the coming decade. And which six were they? Find out by filling in the attached questionnaire. How well do you match up to a management consultant’s idea of the Ideal Researcher?

A distinction is made for those just starting their research careers. In this case, you are given the benefit of the doubt and must possess only 12 of an experienced researcher’s 20 skills. Relax! You still have time to develop a sense of project, team and network management, interdisciplinarity, and self-evaluation. But beware! Before entering the lab, you should already possess an enterprise culture and management skills!

Nevertheless, when it came to the recruitment of young researchers, Deloitte found “true differences” between the private and public sectors. In the public sector, bizarrely, scientific researchers are almost exclusively recruited for their scientific expertise! The private sector apparently knows better – their choice is based on a “larger range of skills.”

Perfecting the Ideal Researcher’s skills at the international level?

However, the report cheerfully notes that many recruiters in the public sector have recognised their error. In future, they will no longer select scientists simply for their scientific skills, but will instead actively develop “recruitment practices that take account of the wider range of identified skills”.

Of course, Deloitte’s report couldn’t resist a country-by-country comparison of relative research skills. After all, this is an international job market and researchers are increasingly mobile. Following ‘market forces’, they can choose to go where the demand, working conditions and career prospects are the most attractive.

According to those interviewed, “there is a wide disparity in the current mastery of the 11 key researcher skills by country, notably among European countries”. However, Deloitte don’t tell us if comments, positive or negative, were restricted to their own country’s performance, or whether they could also pass judgement on their neighbours’.

The country comparison is based on just 11 skills, but includes the six key skills for the future. Apparently, the other nine skills were judged to be at the same level in all eight countries – either well-mastered (scientific knowledge, open-mindedness, motivation and the capacity to formulate a research problem) or universally bad (the capacities to evaluate and self-evaluate, to integrate contemporary research, adaptability, and to learn and change).

Winners and losers

So, on a three-point scale of mastered skills, how well did each country’s researchers score?

The winners, with the largest range of mastered skills came from the

US and the UK. Each claimed to have mastered six out of 11 skills, including enterprise culture, teamwork, networking, communication, and creativity. They only conceded to total incompetence in language skills. No surprise there. The losers, with the smallest range of skills were the French and Japanese. The French have master computer skills, while the Japanese prided themselves on their teamwork. But both considered themselves to be lacking in language skills, communication and enterprise culture.

Like the French, the Germans claimed total mastery of computer skills but were only prepared to admit to total incompetence in managing and directing research teams.

Naturally, the Finns, Dutch and Swiss all trumpeted their language skills. Finland and the Netherlands also claimed computer skills. The Dutch could not think of anything that they were completely incompetent at doing, while the Finns and Swiss both confessed to incompetence in managing research projects (but not teams).

Research paradoxes: A particularly French connection?

Based on 80 semi-directed interviews, a closer scrutiny of the study reveals that some of those interviewed had more influence than others. No doubt to avoid writing



anything obviously ridiculous, Deloitte relied on a six-member French steering committee composed of three public sector scientists and three engineers from industry. The committee's composition reflects particularly strong divisions in French higher education, research and politics between the public and private sectors.

Elements of these divisions were probably reflected in the steering committee's discussions. Apparently perplexed by the discord, Deloitte's onlookers felt obliged to add several remarks under the heading, 'Paradoxes in the world of research professions'.

They observed that the "qualities required to succeed, whether in the domain of scientific knowledge, of management qualities, or of personal characteristics, sometimes seem to have paradoxical aspects".

A conflict of interest?

In effect, they ask just how researchers manage to simultaneously "share and protect the fruit of their research". Obviously, public scientists are compelled to present and publish their results, whereas industrial R&D is founded on the legal protection of intellectual property, especially through the patent system.

Similarly puzzled, they wonder how researchers can, at the same time, "maintain their level of expertise and also become good managers". This is another chronic problem in public research. The more you advance as a research scientist, the less time you have to actually do any research, due to increasing managerial and administrative demands.

Likewise, how easy is it to stay "concentrated on the research project but to be permanently open to the world"? What proportion of our focussed attention is dedicated to the highly specialised details of multiple research projects, compared to the time we spend looking outside our field at new developments elsewhere?

Finally, they ask how easy is it to be "determined to achieve the project's objectives, yet ready at any moment to give up the subject if it isn't considered to be sufficiently profitable"? But of course the private sector approach to R&D doesn't require the same level of long-term commitment to research projects found in public institutions.

Deloitte Consulting are not the only firm to look at questions of scientific research. In 2004, a team from Ernst & Young, another of the 'big four' global auditors, published an article in, of all places, *EMBO Reports*, entitled, "Realities at the leading

edge of research" (vol. 5, p.324-9). Specialists in the non-financial business risks of biomedical research, William Alexander *et al.* wanted to remind scientists, "Good practice and proper conduct in research pay off, scientifically and economically."

Continuing in their pious tone, the Ernst & Young consultants preached the Right Way of Doing Things, "All researchers, even those who are self-funded, have an ethical duty to conduct and document their research properly" because "the public, governments and private investors have a right to expect such proper conduct from scientists. Otherwise, how do they know that the vision, in which they are investing, is likely to come true."

So, what happens if scientists don't conduct themselves properly? "Recent cases at Enron and many others have demonstrated that investors must indeed be careful about where they put their money." Because, in some of these organisations, "people allegedly misrepresented or even lied about their work, their results and their implications". And the consultants do not like this situation because "these cases have all had a negative impact on public confidence in the validity of research findings and the ethics of those who receive public and private investments". This is terrible for business! "How do we avoid investing in the programmes of ethically challenged scientists or hucksters who focus on excitement and emotion over details?" Well, yes indeed. How awful!

Misrepresentations and lies

But, wait a moment. Is there really a link between Enron and scientists? Surely the Enron scandal was the result of massive accountancy fraud, prominently featuring the firm, Arthur Andersen, one of Ernst & Young's main rivals? In 2001, shortly before becoming the largest corporate bankruptcy in US history, Enron claimed revenues of \$100 billion (i.e. many magnitudes bigger than any of the other cases cited in the *EMBO Reports* article). For six consecutive years, Fortune magazine had named Enron "America's most innovative company". In fact, its wealth was based on systematic, if creative, accounting fraud. This huge fraud was possible because its external auditors, Arthur Andersen, did not give a true public account of the company's finances.

So, what does this have to do with Deloitte, the consultancy that defined the Ideal Researcher? Well, Arthur Andersen was just like Deloitte (and Ernst & Young, for that matter). Dating from the 19th century,

the original job of these accountancy firms was to provide a legally-binding, independent, honest and accurate account of the financial operations of commercial enterprises, especially public companies. It is their job to maintain the confidence of investors and trading partners by regularly verifying the companies' financial soundness. However, in the 1980s, financial deregulation allowed these accountancy firms to expand into the lucrative business of financial and management consultancy.

Destroyed by a scandal

Arthur Andersen's critical role as Enron's independent auditors had been corrupted by its desire to continue earning higher fees as its consultants. Arthur Andersen was destroyed by the scandal – its global empire of 83,000 employees ceased to exist. But some of its branches merged with its rivals, helping Deloitte to become the new global leader!

Not that this implies any wrongdoing by Deloitte. It's just that when the consultants make pious statements about how scientists should be behaving, one wonders if they actually follow their own advice. In their article, the Ernst & Young consultants preached their solution, "Ethical researchers must comply with private-sector standards as well as government regulations." In particular, they highlighted the importance of "conflicts of interest" in research and publication. "There must be standards for disclosure, and there must be limitations on ties between personal gain and research results as well as review and oversight by disinterested parties."

The question at the end of this little digression into enterprise culture is: Should the consultants who wrote the APEC-Deloitte study have declared a conflict of interest? Might Deloitte gain financially by pushing inter-

pretations of its conclusions that promote research policies requiring its consultancy services?

How consultants have entered French universities

A recent article at *EducPros* describes the implantation of consultancy firms in French universities (www.educpros.fr/dossiers/investissements-davenir-comment-les-consultants-ont-pris-place-dans-le-champ-universitaire). Since 2007, a succession of reforms have resulted in major upheavals in French universities and public research institutions. Previously, the universities were administered from Paris. Now, they must become financially independent, self-governing entities. Furthermore, their funding is no longer based on automatic block

'laboratories of excellence' (Labex) and 'initiatives of excellence' (Idex) both call for the creation of world-class multidisciplinary scientific research groups. There are around 100 Labex and 10 Idex grants up for grabs. The winners are to receive 'generous' funding out of the 'Big Loan' (see *LT* 1/2010 p.10). The losers are forced to go begging.

Desperate to win, yet with no experience of preparing such competitive submissions with pressing deadlines, the universities have employed consultancy firms like Deloitte and Ernst & Young to help them. The president of Paris-Est university explained how they relied on the consultants' business awareness because the ministry had stressed how important it was for them to show the economic value of their projects and links to the private sector.

"We're not replacing the scientists," said Ernst & Young's project chief, "we're working on the investment logic – marketing, industrial applications, business models, financial engineering, territorial development, innovation and enterprise creation."

Business awareness

Deloitte's chief education consultant explained that at eight universities, they were working on projects ranging from questions of administration to project management or help in formulating, "academic, scientific and strategic ambitions". For example, for the modest sum of €532,000, Deloitte advised the University of Strasbourg on its new, enlarged administration.

Several consultancies are competing for this well-paid business. Consultants working on Labex submissions earn around €1,000 per day. The University of Bordeaux paid out €250,000 for 244 days' work, the University of Lorraine around €100,000 for 100 days, and Lyon University has spent around €350,000.

With one foot in the door, is it entirely unexpected that the consultants should be advocating more reforms that may result in more business for them? In the APEC-Deloitte study, they explained that French researchers did not have enough skills. One of the problems, they say, lies in the education system. It should be 'listening to the market',



As an ideal researcher you have to be able to help yourself when your hard-drive spontaneously self combusts.

grants. The universities must compete with each other to obtain government funds from one of several schemes. For example,

responding more closely to the needs of companies. However, Deloitte has no problem praising actions that “improve” the system of higher education, notably those from which they have gained: the ‘excellence’ initiatives, campus operations, economic selection criteria when calling for project proposals and so on. And of course, the reinforcement of links with industry should include the hiring of teachers from industry for training students in their non-scientific skills.

Managing Research?

Some commentators have complained that Deloitte’s description of the Ideal Researcher has completely redefined the job. They may have a point. After all, just how closely should an Ideal Researcher resemble an Ideal Accountant, Consultant or Manager? Because looking at future trends, if all researchers do end up becoming management consultants, who will be left to do the scientific research?

JEREMY GARWOOD

Questionnaire: Your Scores

Zero A and B points: APEC (or your own national employment agency) doesn’t know how you became a researcher. What kind of researcher are you, anyway? Probably someone who hates accountants, loathes administration and bins bureaucracy. You are either too original, independent or antisocial to require their services.

4 A points: Good with computers and technical figures. APEC asks whether you’ve ever thought of becoming an accountant or management consultant? The ‘Big Four’ accountancy firms employ 611,000 professional consultants worldwide and are always on the lookout for new talent. Don’t forget that they deal in money and know how to make big salaries (and bonuses). Make the transition from an undervalued lab coat to an overvalued suit!

More than 5 B points: Good administrative scores. You’re no doubt sensitive to the relevance of research in the current social environment. Have you considered the human resources? APEC needs responsive, professional employment counsellors to manage its growing pool of scientifically-qualified job-seekers.

6 C points: Too creative! Oh dear, you chose creativity – these are trick questions. Although Deloitte listed creativity as one of the 20 qualities in an ideal researcher, it was not rated as one of the 6 ‘key’ skills for the future – you’re not keeping up with the trends. APEC will probably advise you to retrain as an art teacher or to learn jazz. Either way, you’ll lose your managerial status and fall out of their jurisdiction, joining the general mass of ordinary job-seekers at Pole Emploi.

Maximum A and B points: Congratulations! You’re one of Deloitte’s ideal researchers! In this spirit, APEC will observe the report’s other recommendations and advise you to choose international mobility, taking a risky job with a high career growth potential in another country. So if anything goes wrong, you’ll become a job-seeking statistic for another country’s unemployment agency!

The 6 key skills (according to the APEC-Deloitte survey):

- analysis and mastery of computers and sophisticated IT tools (A1)
 - the ability to work with researchers from other disciplines (interdisciplinarity) (A2)
 - can develop a ‘network’ (B1)
 - possession of an ‘enterprise/business culture’ and management skills (B2)
 - project management (B3)
- and, finally, the single most important quality in the ideal researcher of the future:
- awareness of the pertinence of the research and its impact on the environment (B4).