1.1 THE APPROACH

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The evaluation of a national research system is a bold and infrequent operation carried out, at best, once every 10 or 15 years. It can give fresh momentum to science policy, lending credibility to research and facilitating agreement in strategic decision-making. But it may also end in failure and generate an unproductive litany of grievances or disinterest.

The decision to launch such an operation arises from a particular set of circumstances and the steadfast *will* of the authorities. In this case, it was the Moroccan Ministry for Scientific Research (hereafter referred to as the 'ministry') — first set up in 1998 — that *wanted* an evaluation of the country's potential ([1]), and requested a completely *external* audit ([2]). The European Commission (Directorate-General for Research and Technological Development) decided to back the operation before the signing of bilateral scientific cooperation agreements, and a qualified — external — organiser was selected ([3]).

As the project manager, I now propose to outline the overall approach.

1.1.1 GOALS

First of all, it is important to bear in mind that the evaluation of a research system *does not* set out to assess individual researchers, laboratories or institutions. That is a job, done on a regular basis, for peer commissions, national committees, and other such ad hoc bodies.

What it does seek to do, on the other hand, is to weigh up a country's scientific potential with a view to its classification by location and by discipline, and to pinpoint the issuesthat prevent it from fulfilling that potential.

There are all manner of possible handicaps. These can stem from:

- the professional standing, training, and scientific culture of the researchers, as well as their isolation from the pioneering forefront of science or from the demands of society;
- the paucity or poor organisation of means — equipment, access to literature, and management of funding;
- deeper problems concerning the place and perception of research in society.

So, the evaluation can call into question both the research community — epistemological standpoints, management, and conflicting views as to its purpose — and the outside world; communication barriers between opposing 'spheres' or schools of thought.

[1] All, except the social and human sciences. Originally, the field was divided into nine areas: mathematics and information technology; physics (solid state, material, and nuclear); geology, geophysics, hydrology and water treatment; energy and the environment; agronomy, agriculture, forestry, veterinary science and medicine; ocean sciences, aquaculture and pisciculture; medical and pharmaceutical research; engineering (mechanical, chemical and civil); and space and telecommunications. That is, almost the entire range of 'exact sciences, life sciences and engineering sciences'. Ultimately, this was the division adopted as the frame of reference, with a few additions and a slight shift in the dividing lines.

[2] Along the lines of an earlier audit carried out by Portugal, which served the cause and enhanced the management of research in that country upon its entry into the then European Community in 1986.

[3] The Science Technologie et Développement research group, IRD, (Paris, France).

The goal is not to expose shortcomings, but to publicise research, arouse interest among a wealth of different actors, encourage self-analysis and stimulate debate on the benefits of developing scientific activity, and foster mutual agreement on a diagnosis, outlook and possible plan of action.

Ideally, it amounts to a form of 'sociological intervention' in-and-around the research community, aimed at encouraging the actors to emerge from entrenched positions by building greater trust between them, and by reviving relevance and results as priority requirements all-too-often buried beneath conventional wisdom and self-serving statements.

Efforts to achieve this ambitious goal are not always going to hit the mark, of course. But at the end of the day they should at least produce sound, credible documents that can serve as instruments capable of boosting self-awareness, and underpinning wide-ranging discussions between bona fide partners.

1.1.2 APPROACH

There is no standard recipe for success in such an operation. The evaluation of a research system must be 'made-to-measure'.

It sets out to appraise the state of the system, producing a relief map of its non-uniform features and pinpointing the forces that shaped them. It calls for genuine sensitivity toward the interests, values and conflicting rationales that motivate the actors. It seeks to assess the results, and to grasp the conditions in which they have been produced. It must appeal to well-established scientists, and bring them face to face with the researchers in their laboratories.

The golden rules of the approach are that the evaluation must:

- *keep a distance from* … and at the same time *build trust with* all the stakeholders;
- recognise the value of *face-to-face* encounters *in situ* between the evaluators and the evaluated;
- be carried out by professionals capable of gaining respect for their technical expertise.

Let us take a closer look at these points.

1.1.2.1 Keeping a distance

The credibility of an evaluation depends on it remaining visibly *independent* from both its sponsors and those being evaluated.

In this case, the Moroccan Ministry for Scientific Research had opted to request reports only from foreign experts, which was a bold step to take. On the one hand, it meant that the selection of participants was out of its hands; the ministry approved the list, but the actual selection procedure was left to the operator, which appointed its own Moroccan experts to accompany them on field operations. And, on the other hand, the Moroccan scientific community is full of distinguished figures to whom the task could have been entrusted. The decision to choose foreign experts may have come as a surprise, even though it helped bypass any internal rivalries. But the Minister defended the risky decision vigorously at the National Workshop on research held at the end of the operation, arguing that it gave Moroccan research greater international visibility and clarity, together with a seal of approval that could be conferred only by outside authorities.

Clearly, nothing could have been done in Morocco without the will and the support of the country's authorities; the operator had to listen very closely to their views, reasoning and aspirations. That said, the team of evaluators did manage to stand by its modi operandi and field of action. This formed the subject of discussions and, when necessary, negotiations. But what mattered most was that the team was seen by one and all to be acting as part of a *neutral* information-gathering operation, and not as any kind of government taskforce.

Candid discussions took place at each and every stage — in the selection of experts, choice of sites to visit ([4]), scale of the debriefing, and so on — within the framework of an active steering committee, and under the equally watchful eye of a government minister. Operations were monitored every step of the way. But as long as everybody was kept informed and actions were discussed beforehand, the evaluators were free to investigate any site they saw fit in technical terms — including private organisations — and were never discouraged from doing so.

On the contrary, the Ministry for Scientific Research had had the operation endorsed by the Interdepartmental Research Council (IRC), whose standing secretariat it provided. This opened doors to every public body, regardless of which ministry it was answerable to. It engaged actively in publishing official information on every course of action. And it took a courageous and definite stand for the 'independence of the experts' on the rare yet inevitable occasions during which the evaluators caused controversy in the field because their questions and comments were not entirely supportive of the hierarchical and ideological status quo. In short, as long as in-depth discussions were taking place, our team was able to assert its independence and enjoy the greatest possible latitude.

At the same time, a distance had to be kept from those 'under investigation'. In the early stages, this was possible thanks to the decision to carry out part of the evaluation by indirect means: for example, historical survey, laboratory-based questioning, and bibliometrics. However, the core operation involved visits to sites by a panel of 20 or so foreign (European) experts whose eligibility for selection hinged, inter alia, on their lack of any involvement whatsoever in local research action, even under the auspices of cooperation efforts.

The experts obviously met grassroots researchers face-to-face. Some of these researchers took them to task over their motives, while others demanded that they pass on their

[4] A sensitive point at grassroots level: for instance, 'why evaluate me instead of the others?' Reasons had to be given in the shape of 'objective' criteria, and bibliometrics were a great help in that regard. For more on these negotiations, see the chapter on the role of the ministry.

grievances. The teams they encountered urged them to fraternise with them, and/or to shower them with advice. Occasionally, they were boycotted, but more often they were subjected to a calculated charm offensive. In my view, they managed — as a result of having undergone a lengthy selection procedure — to demonstrate composure and sound judgement, as follows: showing, without a hint of arrogance, that they had not been fooled in the slightest; taking a keen interest in the subjects addressed, in organisational matters, and in the prospects outlined, yet refraining from acting as intellectual leaders; voicing reservations or criticism when necessary face-to-face, and not condemning anyone whatsoever in their reports or writing anything that had not been said in public. So, a good deal of distance was maintained on the ground, which helped steer clear of attempts to curry favour, and served to boost the visitors' credibility as a result.

For the record, the operator's independence vis-à-vis the European Commission was just as great. Once the contract, which set out the work plan, had been signed, it submitted a quarterly progress report but came under no pressure whatsoever to adopt one procedure over another, to choose a particular expert or to tone down the results.

1.1.2.2 Building trust

While an evaluator must avoid the trap of becoming too close to the stakeholders — and, hence, the suspicion that it might be pleading its own case — it is equally important to build genuine trust. Such trust must be deserved, in the eyes of every actor.

In the first place, the operator needs to show complete *loyalty* to the sponsors. Every single procedure must be discussed in detail, and be neither bypassed nor revisited once finalised. Also, the operator and the experts must not seek to turn the action to their own advantage, at either a personal or institutional level ([5]). Finally, the results must be kept in the strictest confidence until endorsed and published. The operator's conduct is judged by the contracting authority, and mutual trust is built — and *cooperation* established — one step at a time.

In Morocco, although this is not uncommon elsewhere, the task was complicated by the fact that the research organisations to be visited were answerable to a range of different authorities. Some even belonged to private companies ([6]). Relationships, therefore, needed to be struck up with the various supervising bodies. The ministry was extremely helpful on that score, as was the operator's tact. Once again, openness was of the utmost importance. The experts themselves visited the authorities concerned and provided them, where possible, with a summary of their observations at the end. The benefits of this became apparent at the final debriefing workshop, which featured some highly varied forms of participation, which had a far-reaching impact.

It is not enough merely to gain the trust of the highest authorities, genuine access to the field also calls for close working relations with the establishments visited. It is a matter not only of keeping them fully informed from quite early on, but also of giving them the latitude for initiative and action. In this case, the experts' programmes included mandatory

[5] Hence, the importance of selecting experts with no particular connections in Morocco. Furthermore, as a matter of professional ethics, the operator did not wish to work with any experts from its own institute (IRD), even though it is hardly lacking in qualified staff.

[6] Initially, there were no plans to visit these, but the issue of how the research was being applied and what was being achieved in terms of R&D was too important to ignore. The harmonious relationship established between the ministry, operator, and the unique Association R&D Maroc group of major manufacturers helped open doors.

visits to such establishments as laboratories known for their productivity or for playing a proven role in R&D. However, it was up to their governing bodies to determine the detailed programme, to add laboratories of their own choosing, and to strike a balance between discussions with managers and discussions over the 'work benches'.

The researchers themselves were free to choose whether or not to take part in the *in situ* meetings with the experts. It was always anticipated that the latter would hold an impromptu debriefing session before they left, especially when the establishment managers had chosen not to attend the laboratory visits, so as to leave the researchers completely free to express themselves.

On site, it is up to the experts to show an interest in the activities, the vocation, the values, and projects 'under investigation'. It is easy to see if the interest is genuine or not. They must also show that they are keen to improve the *system*. The turn taken by the enthusiastic and constructive exchanges in many laboratories on this matter — and, furthermore, on the research themes — was an indication of the commitment of the evaluators.

Given the time and consistent approach required to build trust, the *duration* of the evaluation — nine months — was an advantage. The degree of trust built up was evident given the forthright comments of the managers and researchers invited to the national debriefing workshop. This trust owes much to the conduct of the experts; it reflects an appreciation of their abilities — which must be unequivocal — and of their human qualities.

1.1.2.3 The virtues of face-to-face encounters

A system's evaluation will fail if it appears judgemental. Also, its procedures must neither resemble the routine evaluations of researchers or laboratories nor be entrusted to the same authorities. It cannot be carried out on the basis of 'case files' alone. It requires direct contact with real people in real-life situations. It has to probe the underlying meaning of the work and the interests — whether 'pure' or not — of those involved. The conditions in which the work is done determine its limitations and potency, and these therefore must be tested.

So, *on-site visits and face-to-face encounters* are crucial. The experts taking part must be open to surprise, and display quick and accurate powers of observation. Without the knowledge of the field gained as a result — on production conditions, the frame of mind of the actors, and so on — it is impossible to understand the 'system', how it functions, and how it is likely to evolve.

1.1.2.4 Technical expertise

The stakeholders each have their own experience of the research system, its strengths and shortcomings. They see themselves as experts on the matter, and fully capable of carrying out investigations. However, it is important to avoid the pitfall of amateurism.

As a matter of fact, the evaluation of projects, programmes and, what is more, systems is now entrusted — sometimes wholly — to specialists. This is especially the case in Anglo-Saxon countries where a bona fide profession is on the way to becoming 'chartered' (authorised to certify 'quality'). The European Commission is increasingly using a combination of panels of experts and professional firms.

Accurate tools have been developed. Evaluation practitioners form a small community that meets to compare instruments, perfect their technical aspects, and determine their validity and scope of application. The knack, then, is to adapt those tools to the situation on the ground. This still leaves the matter of becoming proficient in the use of these tools.

Experts in the social and human sciences know that questionnaire and interview techniques form the subject of a considerable and continuously revised body of methodological literature. Statisticians know that sampling cannot be improvised, and that it relies on highly codified practices and theories. 'Scientometrics', which incorporates bibliometrics, has become a bona fide discipline, with its own theories, conferences and journals.

It is up to the operator to gain a grasp of such tools; to ensure that the methodological rules governing their correct use are enforced, to show imagination in choosing to use them at the appropriate time, and to tailor them to the situation at hand. The following pages look at the tools adopted, and outline the overall procedure.

1.1.3 THE PROCEDURE

The evaluation was broken down into *three stages*:

- *review* of the existing 'system';
- *evaluation*, carried out *in situ* by some 20 European experts;
- *debriefing* session at a large-scale National Workshop.

The entire process took place over a one–and-a-half year period. It covered every discipline except the *social and human sciences*.

1.1.3.1 Review

The review relied on three tools, as follows.

(1) A *profile* of the existing system, together with an *historical backgrounder* on the various institutions. This document helped the operator choose its tools, and tailor them to the field. It served as a preliminary source of information that was much appreciated by the experts because it avoided them having to take a complete leap into the

unknown ([7]). It must be stressed that the backgrounder is what makes the document so comprehensive. It highlights the current administrative structures, which would otherwise remain unclear, and records the divergent rationales that still prevail among the actors today (i.e. universities versus national centres, doctors versus engineers, etc.).

(2) A *bibliometric analysis* of Moroccan scientific output published over the past 10 years in 6 000 leading international journals. This analysis provided an overview of existing capacity, with details per site and per subfield. It helped trace how this capacity has evolved over time, and to compare it with that of other countries, especially countries in Africa.

(3) A *questionnaire* sent by e-mail to around three-quarters of all Moroccan laboratories. The outstanding response rate made it possible to gain a closer look at the composition, funding, equipment, working relations and output of grassroots units in all their diversity, and see how they perceived the drawbacks and hardships that needed to be addressed.

1.1.3.2 Evaluation

The *actual evaluation* was carried out by some 20 European *scientists* selected on the basis of their proficiency, experience, and the fact that they were in no way involved in any ongoing cooperation with Morocco. Each expert submitted and publicly defended an evaluation report. A consolidated synopsis was also produced for each major field covered by several experts.

1.1.3.3 Debriefing

The *debriefing* was a key phase of the process.

We do not consider this merely a matter of 'good practice'. It is much more of a means of evaluating the evaluation; revealing the degree of interest aroused by the lengthy operation in and around the world of research, and testing the perceptiveness of the diagnoses. The debriefing process is a high point; not an afterthought but a possible prelude to new ideas and fresh momentum.

The benefit of bringing the many actors making up the scientific field face-to-face with the independent experts is that it gives them each a reflection of how they are perceived by the outside world. In Morocco's case, the scope and impact of the exercise hinged on the scale of the event, and on the free and frank nature of the debate that it generated. The organisation, conclusions and — unprecedented — scale of the debriefing are covered in greater depth in another chapter ([8]).

[7] The experts did, of course, plan their mission carefully beforehand, using their networks and a host of information sources in the international scientific community to gain an idea of the situation, and to prepare a 'grid' of questions to explore in their field. In spite of this, they were happy to gain more information on the whole system.

[8] By Ilham Laaziz, on the role of the Ministry for Scientific Research, which devised, organised and took charge of the event.

1.1.4 TAKING STOCK OF THE EXISTING SYSTEM: TOOLS

A more detailed structural analysis of the results is provided later. I would now like to concentrate on the specific contribution of each instrument used, none of which, as I have already said, is sufficient on its own.

1.1.4.1 Profile of institutions and the historical backgrounder

This was the first document produced. It consists of a compilation of facts ranging from an organised directory of research establishments, through to staff employed, status, budgeting and output to the government initiatives and national policies declared in regard to research application fields. The value added in producing this document stems, as we have already said, from the *historical* survey that sheds light on the data; it maps out the route that has led to — and to some extent shaped — the current situation.

The extensive bibliography, inventory of sources, and abundant tables and annexes make this a 'benchmark document'. It is the fruit of labour of some fine research work done over a long period of time by Mina Kleiche-Dray ([9]).

1.1.4.2 Bibliometrics

This tool is useful for a number of reasons. It provides an overview of the scientific field, lends itself well to international comparisons, and centres on the outputs (scientific production) rather than the inputs (e.g. budgets, equipment and staff), which do not say anything about productivity and efficiency.

What does it involve? The basic principle is simple. There are several large international bibliographic databases designed to keep researchers both informed about subjects they consider important and about new releases. These databases process between 6 000 and 8 000 of the 'world's best' journals. For each article published, the database has a record of the authors, their institutional address, the date, place and language of publication, the title and keywords, an abstract, and sometimes its exact scientific subfield and the references cited.

We selected two of the major non-specialised databases, covering all disciplines (except the social and human sciences): the American Science Citation Index (SCI) and the European PASCAL base. We used them from a retrospective rather than a prospective — what is new? — point of view, recording the full range of bibliographical notes on articles published over the past 10 years by authors declaring an affiliation with a Moroccan institute. By developing suitable algorithms ([10]) — a huge undertaking, although the end product will stand the test of time and require only minor adjustments, and the ownership and

[9] The presentation and interpretation of this wealth of material has formed the subject of several publications including Kleiche, M., 2003, 'From Generation to Cultivation by the State: Progress of Moroccan Scientific Research', *Science, Technology and Society*, 8 (2), pp. 283-316, and Kleiche, M., 2002, 'La recherche scientifique au Maroc', *L'état des sciences en Afrique*, Paris: IRD Full text available at: http://www/ird.fr/fr/science/dss/sciences_afrique

[10] With a view to producing *micro-bibliometrics* that would be useful to Morocco (as opposed to the macro-indicators used for comparisons with the world metro poles of science). It meant having to find strategies to identify and code Moroccan cities, institutions and laboratories, and to aggregate the finely-grained topics singled out through scientific classification, so as to build subfields in which the country does indeed make a contribution. Detailed breakdowns were produced in five-year periods, which helped garner meaningful results.

maintenance can be transferred to a Moroccan research institute — it is possible to *construct* an overview of leading national capacities, the country's main sites (by city, institution and laboratory), how production has evolved in each specialist field (100 subfields identified), its main authors, cooperation efforts, publishing strategies, and so on.

The bibliometric data was useful in many respects, especially in that they helped to:

- assess the number of 'effective' researchers, which is in the region of 4 000, a figure well short of the 'theoretical potential' of around 16 000 (counting all 'teacher-researchers'), meaning that Moroccan research has some room for improvement;
- evaluate the number of teams or laboratories authoring articles (around 800) and, more importantly, given that there is no official trace of them, *identify* them;
- decide, in the absence of other laboratory productivity data, *which sites to visit* — as a matter of principle, those producing the most publications on a more regular basis;
- carry out an initial review of the system, the key findings of which are presented later.

The use of bibliometrics made a big impression on stakeholders in Morocco. Its practical scope may well be debatable (cf. below). But in spite of its limitations, it is a source of relevant data and can be of great help to science policy-makers by:

- providing an overall view of the research landscape;
- highlighting the outstanding features (serving as a 'relief map');
- helping to pinpoint strengths and rare skills;
- helping to make historical comparisons;
- helping to make comparisons with other countries;
- helping to construct indicators.

With slight coding adjustments, the tool is updated each year (bibliographic database updates on subscription). It is useful for maintaining a reporting system.

1.1.4.3 Questionnaire

The questionnaire that was e-mailed to laboratories was designed to give the experts a back-up framework for their observations, just in case the sample of laboratories visited happened to be too small. In this event, it made it possible to compare two information sources, and to introduce some interesting details, especially on the resources used.

Carefully drafted by a highly experienced team, it was originally meant to be sent out to one-third of Morocco's laboratories. But an extra effort resulted in the decision to target them all (some 800 units).

The seemingly straightforward procedure of finding their addresses (including e-mails), however, turned out to be rather more complicated than expected. There were no up-to-date directories of research teams; institutional brochures barely gave them a mention, and there were no address links on any of the few existing websites. Significantly, the laboratories did not yet exist as official entities, and had no regular funding; as such, they were not expected to produce a single report or undergo any evaluation, and remained as good as invisible to partners, including Moroccans themselves.

Aware of the problem, the ministry launched repeated appeals to university rectors and heads of the main research institutes to supply this information. Its intervention made it possible to draw up lists. These were cross-tabulated with the bibliometric data, the mini-reports submitted by laboratories to visiting experts, and the additional information requested from local acquaintances (in the absence of reliable addresses, especially e-mails). Finally, after four reminders, 500 usable responses were received, which is an excellent score given that the questionnaire took almost an hour to complete properly. And the information received was fed into a database of addresses that is now available, and well worth improving and keeping up-to-date.

So, perseverance was rewarded. The results obtained have the virtue of being based on a very large sample of research units. They provide reliable orders of magnitude, and are quite unexpected at times ([11]). They cover, inter alia:

- the size of the laboratories (including postgraduate);
- their funding (supplied by institutions or through contracts);
- external cooperation (international and national, including with the private sector);
- equipment maintenance and documentation;
- application of results.

1.1.5 EXPERTISE

The actual *evaluation* was assigned to some 20 European *experts,* and attended by just as many Moroccan experts. Together, the European experts covered the entire range of disciplines. They were each asked to visit a selection of laboratories and to report back on their findings. Some of the findings addressed the state of the laboratories, the organisation, relevance of the subjects addressed, and so on, and the hopes, doubts and plans of the researchers encountered during meetings arranged on-site.

[11] See the chapter in Part 2 on the electronic laboratory survey by A.M. Gaillard and J. Gaillard.

The success of an operation of this kind hinges on the *quality of the experts*. They were subjected to a thorough screening process. High academic qualifications were a must, but we also wanted them to be experienced in the administration and evaluation of science. As a matter of principle, we were not seeking regular visitors to Morocco; not all were coming to a Mediterranean country for the first time, but none had a particular interest or any upcoming projects in this one.

Given that there was to be a limited number of experts covering every field of science, we needed to find evaluators with wide-ranging skills. Yet the more 'learned' the scientists were, the more specialised they tend to be. One really does have to attain the 'very highest level', experts who are both towering figures and capable of covering a vast field. What makes it all the more difficult is the fact that researchers who are *both of great academic standing and knowledgeable about application* are few and far between. Finding people with such a singular profile called for the assistance of the European academies of science (especially that of France) and of Community networks. Then came the matter of having to persuade those very busy individuals to take part in the operation.

Another condition for success: the *choice of sites* to be visited. When working with experts with a limited amount of time to spare, it is better to direct them to the sites where there is more to see. The bibliometrics helped pinpoint the most productive laboratories in each of the 100 targeted scientific subfields. We used this data as the basis upon which to draw up the routes. We then added, when necessary, major applied research institutions — applied research being underrated in the mainstream bibliographic databases — and we arranged meetings at the national and local government levels, and with private-sector technical managers, R&D operators, users and potential clients.

Key point: the evaluation plans were announced, outlined, presented and discussed well in advance with those in charge of the institutions concerned and their various governing bodies. The programme of visits and the experts' CVs were sent in due time to the chosen centres and faculties. Each was free to sign up additional laboratories, if they so wished. And each research unit was at liberty to decide whether they wanted to be visited or not. These meticulous preparations, carried out remarkably well by the ministry, enabled the experts to *gain access to every site* of interest, where they received an attentive welcome on the part of the establishments, and were warmly greeted by the working researchers. The discussions were extremely candid, and the visits animated.

Each European expert was accompanied by a Moroccan counterpart, selected by the ministry from among the country's leading figures in the field ([12]). They were also joined by a member of the IRD team, who went along to explain how the operation was organised, and to observe the institutional aspects of the research.

Furthermore, Association R&D Maroc — set up by the country's major manufacturers to promote research and innovation — kindly made it possible to include visits to leading Moroccan R&D centres, and to arrange an exchange of views between experts and industry managers on such subjects as research needs and uses, the relevance of local work, and communication between industry and academia.

[12] As it was an *external* evaluation, the Moroccan experts obviously neither intervened *in situ* nor took part in the drafting of reports, which were written entirely, and freely, by the European experts alone.

I, myself, had my doubts at first about the expected outcomes of these on-site visits. But the approach proved *perfectly suited to the size* of the Moroccan scientific community. The 20 experts enlisted covered a distance of some 50 000 kilometres, visiting 13 of the 14 universities, most of the research institutes and schools of engineering, and several private and semi-public companies involved in R&D. Out of the 800 identified, 400 teams or laboratories were visited, which gave the experts unique insight into their activities. Some 1 500 researchers attended the meetings organised on-site — that is an estimated one-third to one-half of all Moroccan nationals currently working in research.

Such an investigation involves more than mere sampling. The distances to be covered may have made it impossible to visit every 'good' laboratory in Morocco, but the limited number of units visited at each location were investigated in great depth. Nonetheless, the information gathered amounted to a corpus. The experts had the necessary skills to grasp very quickly the practical scope and scientific standing — global or 'provincial'— of the subjects addressed, and to assess the extent to which the amounts of equipment or documentation available imposed restrictions on the work. And, wherever they went, their qualities as human beings prompted disclosures and lively debate on the state of the community and the projects in the offing. The operation was considered a token of respect on the part of the government, and a sign of genuine interest on the part of the ministry.

The experts then produced carefully-drafted reports, presented and defended at the National Workshop on research.

1.1.6 THE NATIONAL WORKSHOP

It was the ministry's wish that a large-scale, debriefing workshop be staged — with some 400 participants, representing all those concerned — which would provide an opportunity to freely discuss every single issue felt to be important.

I do not intend to go into the details here of its meticulous and complex organisation. This will be dealt with later ([13]). Instead, here are a few comments on a pivotal operation that broadened and tested the capacity of those concerned to take 'ownership' of the evaluation.

1.1.6.1 The decision

The initial evaluation contract stipulated the organisation of a final debriefing workshop, without specifying its nature or scale. It was the ministry that opted for a large-scale event, at the suggestion of the operator and in spite of the European Commission's reservations.

Commission officials initially feared that the preparation time — three months — might be too short and the debate too staid or confused to do justice to what was being billed as a model operation. It was supposed to justify the signing of a cooperation agreement

[13] See the chapter on the role of the ministry by Ilham Laaziz.

between Europe and Morocco — a first for a southern Mediterranean country. It would be running a risk to present the handover of results 'live', in the presence of the European Commissioner for Research who would be expected to travel to attend the event.

It would be just as much of a risk for the Moroccan ministry, which had to secure top-level government support and to brace itself to face — also 'live' — the unpredictable mood of the stakeholders; first and foremost the researchers. And the operator, for its part, would be putting the credibility it had slowly accrued on the line.

Deciding to attempt such a prominent event, then, was quite a gamble. Nevertheless, those that had followed the entire evaluation (nearing completion at the time) from the start, could see that it was clearly going to yield sound documents and original data. Also, the fact that the long journey of the experts had been generally well received raised the hope that the scientific community would show its appreciation. So, it seemed a risk worth taking. And if it paid off, it would guarantee the operation a far greater impact than that of a mere report. It would give it the political dimension that, as yet, it still lacked and it could establish the resulting texts as an enduring basis for future debate on research.

1.1.6.2 Implementation

Once the decision had been made, everything depended, crucially, on the *organisation* being flawless, and on the operator working closely with the ministry. The organisation was entrusted to a small, extremely efficient and motivated team at the ministry that made every effort and managed, with great composure, to think of everything: the logistics, which needed to be perfect, diplomatic arrangements, and so on.

The operator played a relatively minor role in this, making sure that reports fit for publication were obtained in time from all of the experts, and designating 10 of them — one leading figure per major research area — to come and defend the report pertaining to their specialist field in person.

In some cases, it took a great deal of to-ing and fro-ing between the operator and individual authors to produce finalised texts in a more or less standard, camera-ready format, and include (in any event) certain mandatory points.

A great deal of thought went into the *participation*. The meeting made it possible to compare the approaches of a large number of researchers, institutional leaders, and potential clients. It gave rise to free and lively *debates* that culminated in a body of *recommendations*. Far from amounting to a litany of demands, these (once sorted into an order of priority) helped the ministry establish a largely consensual 'roadmap'.

1.1.6.3 In the wake of the operation

Responsibility for continuing the exercise was then passed on to the Moroccan authorities involved. At the end of the workshop, the Minister concluded that the *evaluation had facilitated dialogue* with the scientific community. He said that he wanted to:

- make the evaluation public, republish all the reports and recommendations, and the debates with other researchers and economic operators;
- undertake the *follow-up*, 'thematic' working groups, on the initiative of the new Research Department;
- *capitalise on* some of the suggestions and recommendations (e.g. accredited laboratories, equipment platforms, electronic access to scientific information, and unifying themes);
- launch a further evaluation, this time of the *social and human sciences*.

In the final chapter of this book, 'Lessons learned and follow up', those in charge of Moroccan science and technology work take a look, with the benefit of hindsight, at the relevance still attributed to the operation, what has been achieved since, and how it can serve to inspire further action.

1.1.7 CONCLUSION

What can be expected from such an endeavour?

First, it is a means of gaining *self-awareness*.

- The evaluation gives a slightly rough, yet fair *overall view* of the 'system', which cannot be provided by any individual observer.
- The experts' reports make it possible to appreciate, *objectively* and *against the backdrop of international competition*, the *strengths and weaknesses* of the existing potential.
- Taken together, the reports suggest measures likely to improve the system.
- And it is a *relatively inexpensive* means of producing a *quick diagnosis* and delivering *easy to maintain* monitoring tools, including questionnaires, bibliometric algorithms, and other such 'performance indicators'.

Second, it helps *publicise* and *promote appreciation* of domestic research, at both national and international levels.

- The aim is to persuade decision-makers and economic operators, here and elsewhere, that it is not a 'luxury' but a 'lever of development'. In this particular case, the experts endeavoured to put forward a number of *good reasons* for conducting research locally, together with some *ideas* regarding relevant and promising themes likely to bear fruit within a reasonable time frame.
- The experts, by the way, developed an interest in the scientific community to which they were devoting their attention. And they testified, in Morocco and abroad, that the country was capable of benefiting significantly from its sometimes highly impressive scientific capacity ([14]).

Finally, the operation has helped *develop an actual evaluation culture*.

- Its very duration ([15]), tenacity, and the qualities displayed in face-to-face situations — proficiency, attentiveness and neutrality — made an impression in the field ([16]).
- It was often seen in the scientific community as evidence of interest. The spirit of dialogue demonstrated at the final workshop also strengthened the bonds between managers and practitioners.
- The resulting self-(re)cognition, together with the freedom of speech, did indeed *give fresh momentum*.

Clearly, it was then up to the stakeholders themselves to turn it to their advantage.

[14] Some teams have achieved some truly remarkable feats with limited means. The subfield reports mention a number of these, in areas ranging from earth sciences to mathematics, and from neurology to information and communication. They pay tribute to the 300 researchers responsible for producing nearly one-third of all recorded Moroccan science, and to the young scientists striving to assert their many up-to-date and original ideas.

[15] From start to finish, the operation covered the period between March 2002 and July 2003.

[16] At a certain point, 'forgotten' districts were even calling for the evaluation to be extended to them.