

How Britain's Engineers Compare

Simon Caulkin

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The poor status and achievement of the British engineers relating to those of other industrial nationalities have been a common place of investigations into the decline of British manufacturing. But the phenomenon isn't recent: it reflects deep divisions in the national culture and in particular in the educational system. A national revival is unlikely to be seen without a radical change in attitudes to the engineering of things.

Who said and when: 'To the multiplication of these polytechnics may be ascribed the general diffusion of a high scientific knowledge in Germany, its appreciation by all classes of persons, and the adequate supply of men competent, so far as theory is concerned, to take the place of managers and superintendents of industrial works. In England there is still a great want of this last class of person?' Or, 'Not a few censors have dilated upon the disadvantages from which young Englishmen suffer in industry and commerce owing to the superior preparation of their competitors in several countries of continental Europe. These disadvantages are real?' Or again, 'Our only chance of national prosperity lies in a timely remodelling of our system, so as to put it as nearly as possible upon an equality with the improved management of the Americans?'

If you said Royal Commissions for the first two, you would be right. But it's unlikely that anybody would have placed the dates, save for the style. 1940? 1930? The First World War? In fact, the first two dates are respectively 1884 and 1895, and the third is a full half-century before that. Richard Cobden wrote it after a trip to the United States in 1835.

The import of these quotes, taken from Corelli Barnett's intriguing pamphlet, *The human factor and British industrial decline*, is that the problems of British engineering, currently in the news again, are by no means new. And the quotations are not isolated examples. They can be backed up, duplicated and varied in a truly stupendous number of official commissions, committees, reports and surveys on industry or education published at any time in the last 100 years. Thus, newspapers were already uttering the familiar complaints about industrial complacency, poor innovation, obstructive trade unions and bad management at the time of the Great Exhibition, supposedly the pinnacle of the Victorian manufacturing era. In the industrial panic which greeted the outbreak of both world wars the warning was repeated for anyone with ears to hear: the English disease, far from being a mild cold in the head which would go away of its own accord, was a chronic condition already long overdue for surgical intervention.

British steel, for example, was already a lame duck in 1914. British manufacturers, remarks the

Official History of Munitions, again quoted in Barnett, 'were behind other countries in research, plant and method. Many of the old iron and steel firms were working on a small scale, with old systems and antiquated plant'. Plus ça change. Later, to re-arm in the 1930s, Britain had to order the major quantity of its machine-tools from, of all countries, Germany, since the British machinery industry was then in roughly the same moribund state as it is in today.

Behind all the smoke-screens of special pleading and blame on circumstances beyond anybody's control, the dismal roll-call of British industries which, one after the other, have failed to meet the challenge of foreign industrialisation underlines the same point. The evidence of textiles, steel, ship-building, motor-bikes, radio and TV, and now perhaps cars, cutlery and domestic appliances, can no longer be thrown out as an exception to a comforting general rule. The unthinkable has to be squarely faced: that it is the Industrial Revolution which was the exception: that far from being, as the story usually goes, the natural and inevitable expression of native British engineering genius, the Industrial Revolution was an accident, pure chance, thrown up by the random concatenation of favourable historical factors. Conversely, it is disorganization and decline which are the UK norm; if so the present crisis is not a temporary aberration, but just another landing on the down escalator on which Britain first stepped a century and a half ago.

Business organizations are, of course, planned, created, run and bungled by people. Hence the connection between the larger UK problem and the apparently narrower concerns of Sir Monty Finniston's committee of enquiry into the state and status of the UK's engineering profession. Would the course of British industrial (and economic) history have been different if the people in charge of manufacturing, financial and administrative institutions had been differently paid, differently qualified; different people altogether? To ask the question is to answer it. Of course, it would, and Finniston's terms of reference, at first sight restricted, in fact lead straight to the heart of the matter.

What, the terms of reference ask, is industry's real requirement for engineers? How should they be educated and qualified? Should they be registered and/or licensed (i.e., should certain work be reserved for qualified people)? And how do other countries deal with these questions? The recommendations which Finniston produces in answer to these questions will crucially affect, one way or the other, the outcome of all the other attempts to breathe new life into the UK's still obstinately unregenerated industry. Whether it likes it or not, the committee is not just reporting

on the local issue of professional engineers' pay and industrial status; in its hands, as Finniston himself certainly recognises, is the shape and structure of British industry into the 21st century.

Term of reference No. 4, the international comparison, should give some indications as to where competitor countries have gone industrially right and Britain industrially wrong. Conveniently, the striking similarities in the organization of engineering as a profession, as a qualification and as a role within industry in major European countries like Germany France and Sweden suggests that superior economic performance there may not be entirely coincidental.

In all these countries, as also in Japan and the United States, the engineering profession has been consciously planned and organized to provide the backbone of industry. French engineering panache and German solidity have no more to do with innate technical genius than did the British Industrial Revolution: they are the product of carefully calculated systems which the UK, utterly misled by its brief 'workshop of the world' interlude, has never bothered to emulate. British arrangements for the provision of engineering personnel, like so many other British arrangements, just grew without premeditation out of what was happening at the time. They have not been significantly adjusted for 100 years. Other countries taking a less casual view of industrialisation and the need systematically to fuel it with a steady supply of technically qualified people, have left much less to chance.

Thus, in this country the question of qualification and the standards needed to acquire it has been left in the hands of the professional engineering institutions, of which more later. In Europe, however, it is naturally assumed that the education of engineers is too important to be left to the various vested interests of the existing practitioners. The State, in fact, plays the critical role of deciding what the output should be and what standards should be met.

One very clear example is France. Chartered engineers in France, the *ingénieurs diplômés*, are the key to the whole technocratic system. Quite literally, they run the country. President Giscard d'Estaing, like many other politicians, most of the high-flying civil servants and an impressive proportion of big-company chairmen, is the product of possibly the most famous and high-powered French educational institution of all, the engineering *Ecole Polytechnique*. The *Polytechnique*, like the other almost equally well-known engineering schools among the *grandes écoles*, emerged not from an industrial, but from a social revolution. In the 1790s, France's classical universities were suppressed by the Convention, and the new engineering schools were set up to centralise and organize education in engineering for all public works, both civil and military.

The new schools took only the best, worked them hard and pushed their products into challenging jobs.

The result was that in the first half of the 19th century, engineering in France was already academically a learned profession and engineers a social and industrial élite. They still are: *M. l'ingénieur* is quite properly a notable in France, well above the solicitor and other professionals on the social scale. He is also the central figure in both private and public industrial decision-making. This is because the French engineer moves with seamless smoothness between industry, civil service and government, meeting and re-meeting his *école* colleagues.

The typical career pattern sees a clever young engineering graduate first of all spending time in a government department, possibly in the Minister's personal *cabinet*, before moving on to a senior job, in the specialisation of his choice, in industry. There his background and contacts automatically entitle him to an enormous premium in pay and status over less qualified colleagues. In its executive survey for 1978, the French business magazine *L'Expansion* not only pointed out the advantages of the *polytechniciens* in pay: it also found that a staggering 37% of its respondents in this category were also chairmen or managing directors of companies.

The consequences of this early insistence on technical excellence are remarkable and pervasive. The dauntingly high standards required by the top schools, together with ferocious competition for the limited places available, consistently attract some of the best brains in France. The intellectual and social respectability of an engineer applies whether he works in private or public industry, or in a government department. At the same time, the high prestige attached to engineering graduates, coupled with their sophisticated numeracy and decision-making abilities, makes them a prime catch for ambitious companies, which (again because of the limited supply) have to compete for these recruits.

The engineers thus have the pick of the jobs, and are frequently found in marketing, finance and other management areas, as well as production and R & D. Over the years, in fact, as in Germany and Sweden, it has come to be accepted that engineering should be the basic training of *anyone* aspiring to industrial management. A general business school degree of the kind favoured in the UK is looked on with some contempt in French business circles as a single qualification: its only value lies in combination with the fundamental technical training. The predominance of engineering emerges very clearly from a recent survey of chief executives in France. Of the 90% who had degrees, nearly two-thirds had studied technical subjects; less than one in 10 had a degree in business administration. Half had come from one of the *grandes écoles*, and half of those again were graduates of the *Polytechnique*.

The self-reinforcing spiral of the profoundly élitist French engineering profession—high standards, intellectual and social prestige, shared assumptions with government decision-makers, and top jobs—is locked firmly into place by the final element of the structure.

That is pay of a level to make British engineers apply for an immediate transfer. French engineers, like Sweden's and Germany's, are extremely well-paid, both absolutely and relative to other professions. A 45-year-old professional engineer in France, for instance, is paid £19,000, five times more than the average industrial worker, more than twice as much as a civil servant and about the same as a university professor. The British equivalent, meanwhile, is struggling along on a beggarly £7,000—double the industrial worker, less than the civil servant and *much* less than the university professor, who is himself hardly one of the UK's plutocrats.

The general picture of the engineer as industrial aristocrat is reproduced with only minor variations throughout Europe. The main points are always the same. In particular, the systematic, State-organized arrangements for engineering education—and, indeed, secondary education in general—stand out. In 1884, when the Royal Commissioners on Technical Education were admiring the Swiss schools and German polytechnics, there was no overall system of technical education in this country. There wasn't even State secondary education of any kind until 1902, by which time it was 50 years old in Germany and even older in France. As the Commission bluntly wrote: 'The one point in which Germany is over-whelmingly superior to England is in schools, and in the education of all the classes of the people. The dense ignorance so common among workmen in England is unknown...'

The comparative situation has not significantly changed in the interim. As in France, the German technical universities are the summit of the whole education system. 'In my day', a German engineer could say seriously to one researcher, 'if you got into the technical university, that was it. If you didn't, you could always become a doctor, physicist or surgeon': entry into these prized institutions depends on the equivalent of a five-subject A level, with very high grades. The UK technical colleges, introduced by the Butler Education Act of 1944, bear no comparison either in number or in quality with the German engineering schools, institutions which smoothly turn out the HND-level *Ing. Grads*, the workhorse technician engineers of German industry, after a five-year full-time, split-level course. As an indication of the difference in standards and expectations between us and them, German engineering school lecturers are required not only to be graduates (*Dipl. Ing*) of the technical universities but to have five years experience in industry *as well*.

The fact that engineering qualifications are obtained exclusively by full-time study, in longer courses at higher academic levels, centrally supervised, is already a major difference between the British and Continental engineering professions. It is from this root distinction that nearly all the other contrasts higher up the tree actually stem. The dominance of the engineering discipline within management as a whole, and its high pay and status, all rest firmly on the base of the initial educational excellence. That base is reinforced by the high prestige of industry itself.

In no other manufacturing country in the world is it necessary to remind people that industry is the foundation on which the rest of society is built. In no other country is the culture and background of the nominal rulers (Parliament and the civil service) so magnificently and whole-heartedly irrelevant to the daily concerns and problems of that foundation. In no other country would the idea of a Minister of Engineering, recently run up the flagpole by the Conservative Party, be comprehensible: everywhere else, by virtue of unified educational systems, engineers are automatically among the rulers and are thus represented in official thinking as a matter of course.

The massive and debilitating cultural schism which separates those who make things in the UK from those who don't goes back a long way: back again, to the Industrial Revolution. The effects of the Industrial Revolution have, with hindsight, been quite remarkably unfortunate in almost every possible way. It lulled not only the engineers, but the country as a whole, into the complacent conviction that the industrial future could depend on the self-made, self-taught man using his native wit, rather than on a proper educational system; a conviction which is still visible in the notorious industrial reluctance to use graduates properly. Within the framework of unfettered economic *laissez-faire*, and repressive social legislation, this approach created within the space of 40 years the alienated, suspicious and embittered working class attitudes which surfaced atavistically in instant unofficial conflict in 1978. And, perhaps most disastrously of all, the Industrial Revolution left almost no mark on the ruling cultural values.

Britain remains extraordinarily primitive in industrial attitudes. On the one hand, the working class culture is uniquely cloth-cap, largely unrelieved by middle-class aspirations; on the other, the culture of the law-makers and *litterati* is resolutely arts-oriented and non-technological. The British ideal of the well-educated man is still the Oxbridge classicist, just as it was throughout the Victorian era. The great engineers couldn't wait to send their offspring to public schools and Oxford and Cambridge, where the last thing they would learn was technical subjects. The result is the worst of all possible 20th century worlds: an élite which is both ignorant of and unconcerned with technical matters, and a hostile working class for whom industrial 'progress' has historically always been seen as a threat to both jobs and the traditional crafts and guilds.

A more stubborn barrier to innovation and new ideas in industry could hardly be imagined. Hence the perceived view of British industry as more favourable territory for relentless class warriors than for creative and intelligent minds. Hence also its low status, and the lack of prestige of those who work in it. Hence, finally, their low pay, which in this case cements the vicious circle—just as abroad the high salary levels strengthen the reverse spiral.

As the Finniston committee addresses itself to the problem of breaking this vicious circle, it comes

face to face with two complicating institutional factors which have extremely minor parts to play overseas. These are the trade unions and the professional engineering institutions. In other manufacturing countries, the situation is very simple. The institutions are learned societies and sources of information about the different branches of engineering. Engineers' trade unions simply are not needed. Collectivist Sweden, not unexpectedly, is something of an exception, but on the whole engineers outside Britain have felt no more need to organize than managing directors. In neither case is there any controversy over their respective roles. Contrast this with the UK. Lacking any central direction, British engineering profession has seen its course and shape determined over the last century almost solely by the 16 professional institutions, from the Institution of Mechanical Engineers through the civils and productions to newer branches like electronics.

The UK institutions, unlike their European counterparts, are the guardians of engineering standards. They decide, autonomously, what the qualifying levels should be for each branch of engineering for a practitioner who wishes to call himself a chartered engineer. They also function, to greater or lesser degree according to their means, as learned bodies keeping their members abreast with new technical developments in their particular field. But for most of the institutions, the main role is the qualifying one.

In truth, the necessity to put a qualification after their names is the only reason many engineers belong to their particular organizations at all—and also the only reason why they pay their fees. This gives the less well-off bodies the most powerful possible vested interest in continuing to play a qualifying role—namely, the distinct possibility that without it they would cease to exist. Few bodies are ever objective enough to recommend their own extinction, and the engineering institutions are no exception. Nor are the trade unions. Pointing to the results of the institutions' long stewardship of the profession ('The institutions have a lot to answer for,' in the words of Roger Ward, secretary to the ASTMS professional engineers scientists' and technicians' advisory committee) the unions are arguing vociferously and predictably that the engineer's only salvation is, like the rest of the industrial workforce, to organize.

The fact of the matter is that disgruntled middle-managers in general, and the squeezed, bullied, demoralised engineers in particular, are currently providing the unions with their happiest hunting grounds in many years. ASTMS, under the entrepreneurial leadership of Clive Jenkins, has gone from a membership of 60,000 to over 400,000 in 10 years. TASS, APEX and the white-collar sections of the TGWU and GMWU have also been putting on weight, though not so fast. None of this is in itself catastrophic. But, in typically British fashion, the conflict between unions and institutions over who is to blame for the current state of engineering, and who should be responsible for what in an ideal situation, is accompanied by a vituperative run-

ning battle between the unions themselves over which of them should be enrolling the potential new engineering members.

On one side are the established unions, which argue with Ward that only the orthodox, TUC organizations can provide the muscle and the spread of collective bargaining services which the engineers need if their competitive position *vis-à-vis* the employer is to be improved. (Ward, adjusting the phraseology to the audience, talks of the unions being 'the fastest-growing service industry of the 1970s', and underlines the economies of scale which the big ones can bring to bear.) As a further refinement, unions like TASS, part of the AUEW, claim that some of the endemic conflict between shopfloor and middle management can be eased rather than aggravated if both are members of the same union.

Ken Gill of TASS, perhaps the chief protagonist of the establishment view in the present conflict, recently asserted in *Engineering Today* that: 'Once the professional engineers and middle managers join an organization like ours, the facilities for discussing their problems with the shopfloor actually blunt a lot of their antagonism and, in fact, on occasions produce quite enthusiastic support. There isn't the slightest doubt that vertical organizations are absolutely in line with the best interests of the engineering industry'.

On the other side are the much smaller, specifically managers' unions, like the Engineers' and Managers' Association (EMA), a member of the TUC (though locked in dispute with that ponderous body) and the non-TUC UK Association of Professional Engineers (UKAPE). The smaller unions play heavily on professional fears of being swamped in the big organizations, and counter-claim that, wherever professional people have organized themselves freely, 'they have decided to create their own unions expressing their own interest,' as EMA's John Lyons, Gill's main adversary, has put it. 'We are quite happy for people to choose, we just think they should have the chance to make the choice.'

The independent unions have been endorsed by the Council of Engineering Institutions, the profession's umbrella body, as the only ones appropriate for professional membership. This move was heavily criticised by TASS and ASTMS as unwarranted meddling by the CEI in industrial relations. There is trouble, too, with the TUC heavies, and conflicts between EMA and TASS have strained the TUC's conciliation machinery to breaking point. The EMA is actually suing the TUC, the first time such a thing has happened within living memory, because of the latter's decision to support TASS in a recognition dispute at a GEC factory near Leicester.

None of this knockabout is much use to the object of the squabbling, the professional engineer. Nor does it make the job of the Finniston committee any easier as it contemplates the relationship of present strengths and weaknesses to longer-term causes and effects throu-

ghout manufacturing industry. This becomes the more true to the extent that the union-institutional rift merely symbolises a lack of consensus on the problems and their solutions in engineering as a whole. Unbelievably, the CEI and some of its constituent institutions were opposed to the whole idea of the Finniston enquiry in the first place. Many other witnesses' evidence has been remarkable chiefly for complacency and lack of interest in any historical or international perspective, while others again do little more than blame all the troubles on someone else. As Finniston noted with disappointment even the individual engineers themselves, under-paid, under-trained and under utilised as they have been for so long, produced little more than a whimper at the meetings held in conjunction with the enquiry up and down the land.

Perhaps the most interesting attempt to lift the level of the argument has come from the Institution of Electric Engineers. The IEE is large and wealthy, which allows it to take a rather more disinterested view of the problems than some of its smaller brethren. It has long had the view that the CEI, set up in 1962, has been a failure as a voice and a standardising influence for the engineering profession, and has already once nearly resigned its membership after the failure of an attempt to get away from the present weak, lowest common denominator, federated structure which prevents important decisions from being taken at all. Recently the IEE has broken away from CEI practice again by deciding unilaterally to raise qualifying standards, weeding out degree courses which aren't in its opinion good enough, and refusing to accept third class degrees.

With qualification as the key to its proposals, the IEE has thrown itself into the Finniston debate with some vigour. 'The present situation', says secretary George Gainsborough 'indicates that since the Second World War, the standards set by the traditional qualifying bodies have not been able to match national needs. Standards have been allowed to stand still while the world around has been changing fast'. This in Gainsborough's view, means that it is now just too easy to qualify as a chartered engineer: too easy from the point of view of the overall national standard of engineering achievement and too easy to be a personal challenge which might attract the best young people into industry.

'Both the national and the personal interests are served by high standards and continuing challenge', Gainsborough believes. 'It's obviously in the public interest to have the best engineers possible. And for the engineers themselves the difference between the high and the low status countries is a qualification, the standard of intellectual attainment. High qualification equals high status, Engineering has been a second-class profession for too long'.

Since the CEI, according to the electricals, has significantly failed in its main job of getting agreement on common basic standards for qualification, the IEE is proposing that a new body should be set up to administer a statutory register of engineers. This body, says Gains-

borough, should be accountable to the public through Parliament, and would include members representing the public interest in its composition to provide a window to the outside world'. The registration body's most important task would be to set the standards of registration, and raise them drastically, over the whole spectrum of engineering, by sorting through the mass of current degree courses, accrediting those which come up to scratch and refusing those which don't. It would also monitor courses to make sure that standards are maintained. Only a body thus composed and legitimised, the IEE bluntly declares, will have the weight to push through the necessary decisions, some of them inevitably painful, without worrying too much about the squeals of pain from the institutions.

The IEE is not alone in coming out for statutory registration, which is one of the matters which Finniston is formally charged to discuss. Some of the other institutions support it, though often preferring self regulation to the appointment of an outside body. The unions support it, too—though they, predictably, insist that it can only satisfactorily be done by a new instrument with a full trade union presence; being interpreted, that means anything but the CEI and its constituent institutions. But the IEE has been the orchestrator of a veritable campaign to convince the enquiry of registration's merits, flying in experts from South Africa, the US and Canada to expound on how the system works there.

It also goes further, suggesting that registration of qualified engineers be complemented by licensing, which in effect means reserving certain higher engineering work for registered practitioners. 'There is a public interest in being sure that such things as bridges, large public projects and aeroplanes are built by people certified as competent to do so', says Gainsborough. 'We're not proposing that *all* higher engineering, *all* dangerous work and *all* public projects should be restricted. It would be up to Parliament to decide where the boundaries lay. But we do feel that, just as dangerous drugs and death certificates have to be administered by properly authorised people, some areas of engineering should be reserved for those on the register. Licensing, which incidentally provides very strong sanctions and teeth, for example on the accreditation of degree courses, is for us the key to this whole line of thinking'.

Others aren't so enthusiastic about licensing. Finniston will have to balance its obvious conceptual attraction as a visible means of rewarding people who reach the required standards, and thus contributing to the essential build-up of an engineering mystique, with the practical difficulties of putting it into operation, particularly in the context of an industry which is unlikely to greet it with overwhelming enthusiasm.

The question of licensing is, however, in the end a relatively minor problem compared to some which the Finniston Committee faces. The most pressing is to ensure that its report does not end up, like so many others, locked away in some Whitehall drawer. To escape that

fate, its conclusions will have to be both controversial, in order to awake public attention and make the subject into an issue which the Government can't ignore, and practical, so that White hall won't be scared off altogether.

This is a difficult combination, and on balance it would be better to err on the side of controversy—if only to keep flickering a debate which has so far hardly set the country aflame. In any case, the situation this time simply does not allow for any half-measures. An added incentive to real nettle-grasping is that the catching up to be done now is not a once-for-all variety: there is an imperative need to build into a new structure for engineering the flexibility to cope with, and indeed encourage, still further and faster change.

Thus, Finniston could well suggest the setting up of a British Engineering Authority to develop and implement the committee's recommendations. As an addition to the ranks of quangos it might not be popular, but it ought to be possible in compensation to clear the ground of some of the less effective institutional engineering wood. A BEA would register, and possibly license, and certainly spend much of its time bullying governments, industry and the reluctant engineers themselves into shouldering some of the responsibilities which they have so comprehensively ignored in the past. Finniston is hoping probably rightly, to keep his committee together to help in the agitprop role after its report has been issued, probably next spring.

Industry itself has a vital part to play—which is simply to exploit to the full the human resources it already has. This ironically, could be the most difficult reform of all to achieve since most companies by definition don't realise the problem until some one else has made a better product or stolen their market, and there are few obvious statutory means of jerking them into awareness. Finniston sees this as one of the main issues. It is not, he believes and many observers agree, that the best British engineers are worse than Germans or French or Swedes; but the level of the average could be improved, and much more important, their scope of operation should be drastically enlarged.

'Industry is simply failing to exploit the flexibility and ubiquity of the engineer to advance engineering in all

its aspects for the good of the country', Finniston says. 'The solution lies basically with the employers, who seem to have the commitment to make the most of the engineers they already employ. All other problems pale into insignificance'. Engineering is an essential discipline to industrial management. The engineers, Finniston believes, should perform much more visible functions within society as a whole.

It can't be left to engineers themselves, however decide when and if they have the courage to do so. They have to be pushed. Here, government responsibility is not enough. This is to conduct a radical, root-and-branch review of what our education system ought to be. This won't be popular either, but it is Parliament's own fault for having ignored the right question the last time. In all our circumstances, it is scarcely believable the country should have spent so much time, energy and that money reorganizing secondary education over the last decade, in order to satisfy party political dogma without actually bothering to ask at all about the final result—the nature and quality of the output. In Europe, and the UK, with its lethal combination of over-ambitious politicians, frequently ignorant civil servants, often philistine industry, and uninformed public could have perpetrated or condoned such a scandal.

What is essential now is to make an engineering education required of many more senior civil servants, political advisers, even bankers. But raising qualification standards, and demanding more engineers in policy-making positions is not enough: only a long-term education policy—not focussed single-mindedly on producing factory fodder, but at least planned with some of the basic knowledge requirements of the late 20th century in mind—can anchor the changes in attitude towards manufacturing industry as a whole, without which other reforms will mean nothing. There is no easy way out of the dilemma.

In fact, as Gainsborough remarks: 'It will be murder. But are we changing the rotten old traditions, or aren't we? As all those earnest commissions show, and Finniston's also reiterate, the UK has been unforgivably repeating its early industrial history for the last 100 years at least. If it fails to learn the lesson this time, and the omens aren't good, it will deserve to succeed.'