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Causes Behind Causes: Historical Evolution of Technological Prejudices in Great Britain's Higher Education System

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Concerning the state of this kingdom, I could never have imagined to have seen it as it now is, for their people begin to fail, and those that remain, by a continuance of bad successes, and by their heavy burdens, are quite out of heart.

British Ambassador to Madrid, 1640

I. Introduction

It is ironic that what the English wrote of the Spaniards three centuries ago is an accurate description of the economic and technological malaise afflicting Great Britain today. Britain has always been a nation possessing formidable assets and still remains so. The stability of Britain’s political institutions and its parliamentary system have been the envy of most of Europe. The eminence and integrity of the country’s civil service have been virtually unparalleled. The level of formal education and quality of British university research and discussion have been acknowledged worldwide. Yet despite these resources, the economic difficulties of Great Britain persist and worsen. In the modern economy where technological advancement is so vital to a country’s subsistence, Britain, whose technology in the past has been in the top rank of innovation, seems to have found its faculties unable to mitigate the nation’s current economic problems. Developments have not been promoted properly, for there seems to be an inability to make Britain’s advantages serve great social and economic purposes. In spite of a notable tradition in science and technology research, British innovations have almost always been transferred elsewhere to be applied, manufactured, and exploited.

For example, by 1900, U.S. steel production was four times that of Britain, and the heavy British engineering, chemical, and electrical industries were rapidly being overtaken by international competitors. Also at that time, British neglect of aniline dyes, although discovered by Perkins in 1856, resulted in Germany controlling 90% of the industry; as a result, during World War I the British were ignominiously obliged to grant special licenses for the importation of Germany’s khaki dye for their uniforms. Yet, despite the rapid industrialization of other countries, Britain still
held a 39% share of world trade in 1899; however, by 1980, their share had fallen to 6.8%. Britain currently faces a deficit in world trade of manufactured goods for the first time since the 17th century (Beuret, p. 669). The trade deficit in electronic and electrical engineering products alone will reach £8.3 billion in 1993; and imports of VCRs, radios, and dishwashers (increasing by 6.3% each year) are expected to account for 70% of the British market by 1993 (Newport, p. 391).

If it were not for North Sea oil revenues, the country would face a massive balance-of-payments deficit; but even with the oil trade, the consequences of the deficit are self-perpetuating. Technical research expenditure has been reduced sporadically to save precious devalued pounds, prompting over 100 scientists from the country's small but crucial pool of biotechnologists to leave the country and work abroad. Moreover, Britain remains the only western nation without a space agency; its space budget is £80 million compared to France's £400 million and the United States' £500 million (The Economist, April 2, 1983, p. 94).

There are various reasons for Britain's plight. Membership in the European Common Market takes its toll on intracommunity trade by adding as much as 20% to the cost of goods for testing and certification requirements, differing standards, border delays, and restraints on service trade. Young British firms have mistakenly tended to use government subsidies instead of market-based risk capital to finance themselves, thus facing frustration in developing follow-on public markets. Income taxes are very high. Stringent bankruptcy laws as well as high minimum wage restrictions have inhibited entrepreneurs. Also, a high proportion of government expenditures for research and development have been traditionally devoted to military purposes, allowing Germany, Japan, and the smaller economies of Europe to surpass British industry in useful and productive technology (The Economist, November 24, 1984, pp. 95–98). Such afflictions as these should be curable with a dose or two of innovative legislation, but the fact that Britain's economic ills remain unacknowledged and, therefore, persist indicates that the sources for the country's economic failures are deeply imbedded in social and cultural traditions which are extremely difficult to alter.

The historic prejudices of Great Britain's higher education system are one such set of attitudes which must be changed if the attributes of British society are to be capitalized upon to improve the living standards for the country's citizens. It is the primary purpose of this paper to explore the unique aspects of the evolution of higher education in Great Britain from the early 1800s to the present day. In the process, distinguishing attitudes as manifested in commissions, committees, reports, acts, movements, and ultimately in institutional arrangements will be highlighted. All of these support the conclusion that a large part of Great Britain's current economic woes is due to the encumbering of its higher education system by traditional aristocratic and societal prejudices.

II. Early Victorian Era—Status Quo Biases

As Britain has only recently realized, education (particularly higher education) can heavily influence a nation's technological advancement and economic potential. It also acculturates society, thereby instilling attitudes and expectations which may either facilitate or hinder technical and economic progress.

British education prior to the coronation of Victoria was geared to the maintenance of the social and economic status quo. In regions of Great Britain undergoing industrial and commercial expansion, such as Yorkshire, "non-conformist" manufacturers were denied acceptance to Oxford and Cambridge because of a resistance to "vulgar men of trade" ("The Hudson Report," p. 82). They therefore established and supported their own separate schools, Young Men's Improvement Societies, which provided mechanical training for those unsuited by background or means for the "refined heights" of university education ("The Hudson Report," p. 82). It is true that there was some foresight regarding the social and institutional structures Britain would need in the emerging industrial age; however, such ideas were expressed by those societal groups desirous of maintaining their traditional economic and
political power in the face of the challenge of the new entrepreneurial and manufacturing classes. Adjustments of the educational system thus tended to guarantee continued division between the traditional classes of society.

A distinction was made between education for scientific and technical knowledge and that for grooming for power. This distinction, based primarily on the issue of class rank, would have been less significant if it had not given further impetus to the separation of the technician and his skills from the mainstream of society, which Britain's rigid class system had induced. The ostracism of the technologist reflected the supposition that the future of Britain would be determined not in confronting the challenge of German and American scientists and inventors, but in embellishing and refining the genteel qualities of the British lifestyle. Such elitism widened the separation between technology and pure learning and thus downgraded the status of the scientist. In a society so influenced by the creed of social station, the role of the scientist was one of service to an ideal of genteel governance. Science was regarded as necessary, but it was not the primary factor in the economic system. It was not allowed to divert educational practice from its essential role of educating for rank. Thus, Britain's future was to be best secured by encouraging technological advance but always within the strict bounds of traditional order. A clamor for crude scientific progress was regarded as jeopardizing the true purpose of academia based on the Oxfordian ideal of education as a liberal edification of the elite—a grooming for power. Education was not "practical" in any other sense of the word (Pollard, p. 160).

In the 1880s, when the provincial technical colleges of Birmingham, Wales, Victoria, Manchester, and the new colleges of London evolved from an expansion of the Young Men's Improvement Societies, they were regarded not as heirs of Oxford's traditions, but as working-class equivalents—concessions to the vital national need for scientists and engineers. Thus, a unique but debilitating hallmark of Britain's educational system was the introduction of class structure into the study and application of science at a time when other countries were rapidly and unconditionally advancing their technological bases. As Matthew Arnold, in his position as a school inspector in the early 1800s, had observed:

So we have amongst us the spectacle of a middle class cut in two and in a way unexampled anywhere else, of a professional class brought up on the first plane, with fine and governing qualities, but without the idea of science; while that immense business class, which is becoming so important a power in all countries, on which the future so depends...is in England brought up on the second plane, cut off from the aristocracy and the professions, and without governing qualities. ("The Hudson Report," p. 83)

Matthew Arnold's comment not only was a perceptive insight into the nature of British education in the early 1800s, but also highlighted a crucial facet of Victorian upper-class attitudes elicited by the technological challenge of advanced industrialism. Despite the fact that the railroads, bridges, and iron ships of British origin had spread Britain's influence worldwide, the engineer was still viewed as an adjunct to the factory system. Only civil engineers appeared as a professional group in official statistics and censuses until 1881, and then only because most of them espoused the snobbish habits of high Victorian "gentlemanly" demeanor ("The Hudson Report," p. 84). However, such chauvinism could not continue for long, as the British became aware of their fading position in the expanding industrial world.

A. The Devonshire Commission

During the 1880s, there came a growing realization among politicians and industrialists that Great Britain's position as the "workshop of the world" was being challenged by the rapid industrialization of Germany, France, and the United States. A commission established by the Duke of Devonshire at this time collected volumes of fascinating snapshots of the late Victorian industrial society and, even at this early date, also evidenced concerns over the rapid modernization of Japan—"the yellow peril" (Ashworth, p. 22). The Commission further noted that the largest engineering school in the world with English as the primary
The language of instruction was the Imperial University of Tokyo. Thus, throughout the century, educational and training issues bore testimony to the parlous state of the English system. Indeed, to even call technical education and training in Britain a “system” was a stretching of the word’s definition when compared to models in the United States, France, and Germany (Ashworth, p. 22).

The acute shortage of technically-skilled workers on all levels in Great Britain was first revealed as the country began to lose its dominant market share in the world’s economy in the aftermath of the 1880 depression. There were attempts to remedy this deficiency with the establishment of science and engineering departments at Cambridge University, the expansion of London’s Imperial College (a “technical school”), the associated promotion of art and design colleges, and the wholesale foundation of evolving mechanics institutes. However, these merely represented isolated, incoherent, and fragmented responses to the national challenge (Ashworth, p. 22).

Unfortunately, the parallels drawn between the findings of the Devonshire Commission of the 1880s and Britain’s situation even today are many. In 1984, the Information Technology Shortages Committee was formed to investigate Britain’s stagnancy in technological development. As the Committee concluded in its report, “The Human Factor—The Supply-side Problem”:

There is an intensifying national concern about shortages of technological manpower and the loss of the UK’s market share in the rapid-growing information technology sector...The market could comfortably absorb more graduates with requisite skills now and additional graduate manpower with skills above and beyond expansion already planned and required for the rest of the decade and beyond. (Ashworth, p. 23)

B. Trading Nation vs. Industrial Society

The primary reason for the scarcity of skilled technologists and engineers in Great Britain during the 1800s was that such positions had never commanded a high status in the nation. The wealth-creating role of industry, in which those individuals played an important part, was simply not recognized; for in its formative years, Britain had achieved prosperity as a trading nation, not as a manufacturing nation. Until the late 1800s, the British Empire was a dominant force in the world. It could sell to other countries the products it wanted to make, at the prices it wanted to charge, and, in turn, could purchase from these countries the raw materials it needed at prices it was prepared to pay. Since indigenous manufacturing did not have a very significant role in Great Britain’s economy, it was neither a compelling focus of national effort nor a source of national identity. Hence, there was no need for the nation to establish an education system to provide highly competitive and imaginative engineers for industry; the system needed to graduate administrators capable of running the Empire. In fact, John Stuart Mill expressed scorn for the development of Britain into an industrial society in a popularly-supported sentiment:

I confess that I am not charmed with the ideal of life held out by those who think that the normal state of human beings is that of struggling to get on..., the trampling, crushing, elbowing and treading on each other's heels...[are] but the disagreeable symptoms...of industrial progress. (Mill, p. 749)

In contrast, Germany and the United States, lacking the privileged trading position of the British Empire, gave high priority to the organization of a powerful industrial infrastructure. Industrialization became ultimately connected with a sense of national identity and pride, and the technical institutes responsible for training the “industrialists” acquired a prestige which rivalled that of the older academic institutions. As a result, they attracted a large proportion of the most able students of the era (Beuret, p. 668).

III. Early 1900s—The Evolution of Technical Colleges

Although an education based on technical training was socially denounced by Britain’s citizens, by the early 20th century industrialism became vital to the country’s future. The
British could no longer be indifferent to the role industry and manufacturing played in society because the country now had to compete with newly-industrialized nations. Likewise, Britain could no longer be preoccupied solely with the distribution of wealth, but now had to focus also on the generation of wealth if it were to maintain its national prosperity.

Although the rich landowners and aristocrats could afford to be illiterate or innumerate, the ordinary mill operators could not succeed without at least rudimentary schooling and training. Therefore, the schools which subsequently evolved provided training specifically for jobs created by the new industrial expansion. They provided the opportunity for factory-employed individuals to learn from their fellow workers the skills they needed to perform competently. These new “colleges,” as they were called, were not haunts of privilege, accessible only to the prosperous, but rather were designed to educate the working class. Most students were local and part-time, and the educational programs catered to their need for skills to do the jobs which society suddenly demanded. Still, these new schools were denied appropriate esteem and recognition in Britain, and the deprecation endured (Ashworth, p. 24).

Traditionally, in most societies the universal measure of accomplishment in education has been that those educated are able to conduct satisfying lives, lead rewarding careers, and contribute to the prosperity of society by fulfilling its needs. In Britain, however, this pinnacle of success has been attained only by the university scholar who is invited to remain within the institutional walls of academia but not by the college student who ventures out to the working world. It has been a tragedy that Britain’s educational traditions were institutionalized in the ways they were at the very time that the basis of emerging industrial society was being defined. Other countries have had no such difficulties in reconciling and institutionalizing varied academic traditions. In recognition of this dilemma, in the 1900s Great Britain’s concerned educators and public officials developed several proposals attempting to redefine the country’s national educational objectives.

IV. Reforms in the Mid-1900s

A. Education Act of 1944

After decades of futile attempts to establish equity between Britain’s universities and technical colleges, educators still failed to draw upon the national community as a whole to obtain the technologists, engineers, and managerial talent needed to fulfill the requirements of the country’s industrial program and economic development. Even the Education Act of 1944,¹ hailed as an example of egalitarian legislation, succumbed to the inexorable pressure of social forces that proved more influential than mere laws. A decade after the passage of the Education Act, only 8,500 pupils from the “modern” schools took the examinations for the all-important Certificate of Education, while the grammar and public schools provided over 186,000 candidates. Thus, the children of the middle classes were the major beneficiaries of the expanded and improved education system, not the less privileged who manned the factories and farms. Early withdrawal from school, induced by poor facilities and straitened home circumstances, manifested the failure of the 1944 Act to broaden the academic opportunities for working-class children. Consequently, the poor performance of the British in expanding the base of higher education with this Act ironically only served to reinforce the propensity of the system to entrench social differences (“The Hudson Report,” p. 84).

B. Butler Act

The Butler Act (1950) intended to rectify the backfiring of the Education Act of 1944 by subsidizing with government funds the “elitist” academic system to make it available to all

¹The Education Act of 1944 created two main sets of higher educational state schools—grammar (academic) and secondary modern (mainly vocational). Student selection depended on qualifying tests, with one-fifth of primary school graduates going on to the grammar schools. Parallel to these were several hundred private (so-called “public”) schools.
British citizens, regardless of income or background. The outcome has been that the educational system has become the route through which bright, working class and lower middle class students have moved into leadership roles in Britain, mostly in the public and private sectors of industry. Consequently, the mechanics of the system has become confused with its content, and those who have “succeeded” have believed that their education has been responsible for their position in the world. In fact, most have obtained their positions in spite of, rather than because of, what they have learned. Their presence in increasing numbers has enabled them to dominate industry’s educational attitudes, particularly its attitudes towards recruiting. “Hire in my image” has been the unspoken but obvious message and the outcome has been inevitable. As the number of young people moving into higher education has grown, so has the shift towards the “academic” in the educational system. This move has been nothing if not responsive—particularly in reinforcing its own intellectual values (Gorb, p. 26).

C. University Grants Committee University

Such attitudes as those previously discussed were detrimental to the training of future industrialists as the expansion of British higher education in the 1960s occurred exclusively in the context of liberal education. All institutes of higher education evolving at this time were patterned after a model devised by a committee commissioned by the government to take responsibility for the orientation of university spending, thus the name University Grants Committee (UGC) University. The prototype was an institution enrolling 3,000 students, which maintained a balance of arts and science curricula and was preoccupied with scholarly academic research. The opportunity to transcend the bias against applied science, engineering, and business was still rejected. The channeling of educational resources was not deliberate; but since society had generated such a prestigious image for those of the “liberal” tradition, students were reluctant to pursue vocational-technical training. This was particularly true for students with distinguished credentials. Because a degree in engineering in the ’60s was still considered (even by industry) to be inferior to a background in classics or letters, many brilliant scientists were steered away from industry. Moreover, although there have been recent attempts to advance scientific management with in-house training programs in the modern branches of industry (such as electronics, chemistry, and oil refining), it has not been the case in many of the traditional branches (such as shipbuilding, machine tools, and building construction). Thus, technological progress in Britain has fared poorly when compared with the rest of the world except perhaps in the auto, aircraft, and oil industries; for poorly-talented managers and skilled operators have failed to appreciate the potential of scientific advancements (Lieberman, p. 84). As an example, a few years ago when some British engineers recognized the potential of transistors, many of their countrymen labelled them “cranks” and “eggheads.” Even some in government remarked, “It’s all very well, but we can’t afford to put development effort into uncertain ventures especially when it is not possible to be convinced the market will take up the widget” (Newport, p. 392).

D. The Robbins Report on Higher Education

It is certainly disconcerting that the wrong emphasis has been placed in Britain’s higher education system; but just as disconcerting is the fact that too few people are admitted to the higher education system. In fact, despite high levels of public spending, the size of British higher education enrollment has been one of the smallest in the industrialized world. This is a reflection of educators’ belief in concentrated quality and minimal number of students in the classroom. This belief has sprung not only from the tradition of designating education as a guardian of the opportunity hierarchy, but also from inadequate attention at the planning level as to exactly what the long-term aim of educational policy should be (“The Hudson Report,” p. 85). In an attempt to overcome this attitude, the Robbins Committee was formed in the
1960s. The Committee was a group of concerned educators commissioned by the British government to review the pattern of higher full-time education in Great Britain, and in the light of national needs and resources, to advise Her Majesty's Government of the principles upon which its long-term development should be based (Cmd. 2154 HMSO, 1963). The ensuing Robbins Report on Higher Education concluded “that the supply of places should be based on the demand for places from potential entrants, rather than on the demand in the economy for the products of higher education.” In other words, individual choice was to be the basis for plotting university expansion rather than the needs of society or the economy (Layard, p. 21).

As a result of the Robbins’ findings, the University Grants Committee announced in 1967 that the major increase in university places was to be in the arts rather than in the sciences. Consequently, the failure to provide a more ambitious program for science teaching on the university level reflected a confused official outlook on science policy in general (Gorb, p. 26). Even teacher training became confused and incompatible with the demands of modern economic life. As Michael Duane has observed, “[W]ith the introduction of new machines, new materials, and new forms of organization and control, teachers have found themselves more and more at a loss of what to teach. They have, therefore, been thrown back on the idea of education ‘for leisure’ rather than ‘for work’ (Duane, p. 3)." Hence, from teachers to university graduates there has developed an incompatibility of ends and means, and teaching has continued along its traditional course with little provision for future technological demands. However, teachers alone cannot be blamed for perpetuating the arts/science division in Great Britain. Debates about a credible industrial future for the country have been further frustrated by the funding discrimination between traditional universities and polytechnical institutes.

V. Technology's Role in Education

A. Polytechnical Institutes

Due to economic recession over the past two decades, the British government has cut spending on higher education, hitting the system where it has hurt most—the applied science and engineering programs of the polytechnics. In recognition of the deterioration, many British higher educational establishments have stopped competing with polytechnics for students, realizing that such advanced technical training colleges have a potentially effective role in producing first-class technical engineers.

But if fuller cooperation between polytechnics and universities is to be obtained, the British professional society will have to rid itself of age-old values and stereotyping. A 1980–82 Brunel University/Department of Education and Science study found that for employers using higher education as the primary screen for recruiting, the type of institution attended is more influential than the type of curriculum studied. Many employers also believe that universities offer an environment superior to that of polytechnics for students to develop their abilities and personalities. Moreover, employers are aware that undergraduates in polytechnics need lower entry qualifications than those in universities. So for employers who visit institutions to recruit employees, universities contain a larger pool of suitable applicants. The shortage in Britain of trained engineers has recently been acknowledged by economists. However, until the objective of parity of higher education institutes has been accepted by society and engineers in technical colleges have been given opportunities for science instruction on a par with those given in the university, the expansion of the supply of engineers will be discouraged (Boys, p. 33).

B. A-Level Examination System

Another discriminating feature of Britain's higher education institution is that entry to degree courses has been governed by the...
A-level examination system. 3 Ironically, the A-level system has proven to be a device for terminating the general education of engineers at age sixteen. While their counterparts in other countries have been studying ten or twelve subjects for a baccalaureate, British engineering students have been obliged to forego studies in foreign languages, English, geography, history, and economics in order to focus on intensive courses in math and physics. Such students have undertaken their degree studies with a "tunnel" view of engineering and a poorly developed general education. In fairness, their weak knowledge of the arts has been matched by the technological ignorance of their university-trained colleagues; but it will be these same people who are asked to see the others' point of view when they interact in the future as engineers on the one hand and as salesmen, civil servants, administrators, and politicians on the other. Undoubtedly, such interaction will prove to be difficult. It is true that engineering students have been exposed to a very limited range of nontechnical studies—e.g., organizational management, economics, human relations, industrial relations, and communications. However, they have had difficulty in appreciating such studies since they have been encouraged by single-minded technical lecturers to accord low status to such extraneous material. Arguably, an education that has not equipped engineering students with a broadly-developed view of the world has not been unique to the British system; but it is curious that there have been no concerted efforts to remedy the situation in Great Britain (Beuret, p. 669).

C. Middle-Management Training

Another essential complement to technological progress has been managerial competence. Again, it is peculiar that although a career in management has long been an accepted route to status and reward in Germany and the United States, this has never been the case in Great Britain. Eighty percent of German chief executives and 90 percent of French chief executives have university degrees, but the majority of the British CEOs have risen from the shop floor. Only 40 percent have attended university. The anti-industry bias in Britain's education system and the prevailing attitudes of the elite have not only weakened the ability of British management to respond to the complex demands being made on it but have also inhibited changes in technological and managerial education. Back in 1908 when there were ten universities in Germany with 14,000 students enrolled in management-training programs, Britain had only a handful of training schools of an inferior quality with only 3,000 students. The development of any type of rigorous professional education for managers occurred late in Britain's industrialization (in the 1930s); thus, the practical men with no formal training who had managed British industry for so long were very hostile to the newcomers with their professional training. As a result, only minimal training in managerial operations has been offered throughout Britain's industrialization. Moreover, those so trained have been granted no appreciation, recognition, status, or reward from society. Thus, Britain's technological growth has been severely restrained not only by a lack of skilled engineers but also by an inadequate supply of skilled managers (Hodges, p. 47).

It is not surprising then, that British innovative technical design has been followed by a failure to discern and exploit market potential. The identification of possibilities for product development, the design for production, and the marketing of technically-sophisticated products have been cross-disciplinary areas in which the British have been weak; for such ideas require an understanding of technology in its industrial, business and commercial contexts. Yet the British have persisted in educating engineering students who will be excluded from higher levels of corporate and national decision processes due to their lack of managerial skills. This has narrowed the range of available career destinations and has limited

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3The A-level exam is the final assessment in a hierarchy of extensive educational tests which are given to students at various levels of schooling to determine advancement to further study.
salary ceilings, thereby perpetuating the low status of technical students. But what is even more critical, it has also robbed both industrial organizations and the nation itself of the contribution which such graduates could make to the highest levels of policy development (Pollard, p. 61).

D. "Education for Capability"

An indication of the British industrialists' concern for the inability of the nation's education system to produce competent industrial managers is its support for a recent educational reform movement called "Education for Capability." The manifesto of the movement has not promoted technology and engineering curricula per se in place of history and classics, but it has advocated a return to practicality and research which emphasizes methods of design rather than only esoteric scientific research. The main task of managers is not merely to make decisions, but to implement them while identifying and solving the problems arising in the process. The efforts behind the movement have been valiant, but at odds with British societal inclinations. As a result of the movement, the imbalance in educational attitudes towards producing critics and evaluators rather than makers and doers has worsened rather than improved. Moreover, the leaders of British industry, including personnel managers themselves, have remained both prisoners and protagonists of the distorted educational ideas (Gorb, p. 25).

E. European Technology Institute

As if the social impediments in British education were not agonizing enough, actual management training curricula have been severely impaired by the skill levels of its teachers. Students of Britain's business schools have been told how better use of technology has been helping the United States and Japan seize competitive markets; yet the students spend less than 5 percent of their time studying technological advancements, primarily because their professors have been poorly informed. At Cranfield, a business/management school, 70–80 percent of the installed new technical equipment such as computers and word-processors have not been properly exploited because they are not understood (The Economist, March 2, 1985, p. 72). Such a predicament has been worrisome and has led to Britain's recent enthusiastic involvement in Gyllenhammar-22, a roundtable of European chief executives who have advocated a European Technology Institute to provide on-the-job technical training. The Institute has developed postgraduate technical management programs and also has attempted to promote essential technical cooperation among universities and the industrial community within Europe (The Economist, March 2, 1985, p. 72).

It is not merely cynical to suggest that an education system is motivated by economic pressures, for it has been proven true. Yet J.K. Galbraith has explained that in Great Britain when the state of its economy has demanded that the majority of workers be skilled or at least semi-skilled, the education system, private or state-run, has not succeeded in meeting such demands, particularly in higher education (Reader, p. 204). Exemplifying this in Great Britain, where the state has supplied the majority of training for an economy run primarily by private enterprise, there has been no coordinated planning. The education system has imposed substantial costs on the taxpayer, and the willingness of the taxpayer to finance a further expansion of higher education has been dampened by the taxpayer's concomitant desire to purchase more consumer goods. In reviewing the situation, it is clear that unless increased productivity in the future is proven to be a desirable alternative to immediate consumption, the British taxpayers will continue to spend their income instead of providing investment capital. Furthermore, the demands on the British government's revenues have been intense, and the education system has faced keen competition from other claimants for the resources which it needs to expand. Nevertheless, the rapidly evolving technological industries have been clamoring incessantly for more highly-skilled laborers, technicians, engineers, and managers (Reader, p. 204).
F. Finniston Report

To counteract the skills shortage in light of the deficient funding for higher education training programs, the British House of Lords technology committee’s 1980 Finniston Report proposed industrial in-house training. As the report stated, “Industry has unfairly relied on recruiting ready-trained manpower. In the past the blame has been placed on scarce government spending for education, but now it must be apportioned to industry itself” (Wylie, p. 24). Since specialist skills can be learned in industry only by expensive trial and error, the committee suggested that higher taxes be levied on companies not conducting training programs. To prevent this, industries have been seizing the initiative and have been collaborating with higher education programs. Until recently, the contact between education and industry had been limited to industrial visits, student placement, vacation work, and talks given in schools by industrial specialists. But now industries have begun to accept the necessity of investing in employee training and have thus become more willing to undertake corporate responsibility for continuing education and re-education of their workers. Simultaneously, universities have become more willing to accept joint ventures with selected industrial partners as long as continuing education occurs in an appropriate intellectual environment. Industries have even begun to contribute directly to curriculum development with resource literature, financial and logistical organization, and specialized staff instruction (Holmes, p. 24). However, if the dichotomy is to be resolved, the words of the British Institute of Management must sound loud and clear: “Everyone—and particularly those working in industry or industry-linked jobs, and those guiding the attitudes of the young—should understand at least the reasons for the existence of industry, and the essential contribution it makes to the national wealth, and therefore the quality of life in our society” (Shaw, p. 2).

G. Information Technology Institute

Responding to this recent movement for collaborative ventures between industry and higher education, in 1984 the University of Salford approached the British National Computing Centre (NCC) with a proposal to establish an Information Technology Institute. The purpose of the Institute was to provide training in key technological disciplines to students who would graduate to fill critical manpower vacancies, thereby halting the growing national shortage of technically-skilled workers. The University and the NCC have received industrial support and governmental funding for the Institute over its initial five years, after which its future will be determined by its meeting of market needs. The main contributions from industry so far have been in the form of state-of-the-art equipment and a specialist teaching staff. Application of new technologies in engineering, advanced manufacturing, business administration, and the service industries of home-banking and home-shopping has been programmed for three-year undergraduate and one-year postgraduate studies. Industrial and commercial partners have been directly involved in the academic studies by offering training courses tailored to their needs to approximately 1000 undergraduates and 250 postgraduates. Although there was doubt originally as to whether well-qualified candidates would be attracted to the Institute, the renowned expertise of the NCC in training and computer-based learning techniques has significantly contributed to the school’s allure. Moreover, joint ventures and consultation with United States’ industries and universities have drawn much attention (Ashworth, p. 23).

H. Other Recent Projects

Additionally, several other significant steps have recently been undertaken, underscoring further the need for higher education to focus on science and technology so that Britain might more effectively compete in the world’s economy in the future. Although industrial manufacturing currently accounts for only 23 percent of Great Britain’s gross domestic product (GDP), the government has realized that it must begin to plan for the depletion of the North Sea oil reserves. Therefore, at the end of
1984, the chairman of the University Grants Committee invited British university vice-chancellors to use additional resources for technical training and to admit extra students into technological disciplines beginning in October, 1985. The Scottish Office concurrently announced that £14 million was to be injected into Scottish technical colleges over the following three years in anticipation of a substantial increase in the number of engineering graduates by 1990. It is hoped by British industrialists that British universities also will be graduating more engineers each year (Research Management, February, 1985, p. 12).

Universities and industries have begun to form technology pools and even separate companies to exploit their research through design and licensing agreements. The most successful of these has been at Cambridge University and has been appropriately dubbed the "Cambridge Phenomenon" (Eustace, p. 20). The Ministry of Industry has coordinated an Education Unit to encourage more industry/education cooperation, to improve attitudes of classical educators towards industry, and to promote careers in industry. The Education Unit has also attempted to develop a curriculum that is directed away from the traditional exam-based syllabus to one which cultivates the meaningful experiences of life. "Young Enterprise," the name of a program coordinated by educators and industrialists, has organized pupils aged twelve to nineteen in mock companies for eight months where they have been advised and guided by managers of local firms hoping to instill middle-management philosophies. Offers of work experience, visiting speakers, pupil employment, and stimulating materials and resources have even been expanded to the primary education level. These are intended to reduce ignorance and generate enthusiasm for industry and technology in general (Ellington et al., p. 53). Furthermore, "silicone valleys" have sprung up in Great Britain as a result of investments by IBM, Hewlett-Packard, Digital Equipment, Honeywell, and Modcomp. Finally, university-supported "science parks," adapted from America's Stanford University, have provided an academic outlet for those with much spare time and entrepreneurial energy, but with little capital; they have attempted to keep high-tech manufacturing in Britain's own backyard (The Economist, October 2, 1985, p. 95).

VI. Present Policy

When one reflects on the worthy endeavors of many educators and industrialists to counteract Great Britain's current technological and economical plight, it is peculiar that the country's problems have persisted. However, traditional attitudes have continued to antagonize the remedial ventures. For the 1984–85 academic year, the British government cut the volume of university grants by 8.5 percent. This amounted to an 11–15 percent reduction in funds for university research, a 5 percent drop in student population, and a 15 percent decline in the academic staff. The official policy was to have been to spread the cuts uniformly, but science and engineering bore most of the burden. Thus, when British universities commenced their 1985 academic year, for the first time since World War II there were fewer places available in science and engineering curricula than there were students wanting to study such subjects (The Economist, October 2, 1985, p. 93). There was added furor when the UGC also imposed heavy funding cuts on the technical institutes of Aston, Bradford, Surrey, University of Manchester Institute of Science & Technology and inexplicably, industry's "own" schools. For example, Salford experienced a 44 percent cut and Stirling a 27 percent cut. The strength of Britain's UGC's "block grant" system has been that it guarantees constitutional independence between education and politics, but it also has enabled educators to "do as they please" with their money. Since most of the educational policymakers have been professors whose expertise is in the "traditional" disciplines, they have not been receptive to sanctioning their own demise;

The block grant system is the manner in which government funds are distributed among Britain's higher educational institutes. The money is transferred from the government to the institutions by the University Grants Committee and allocated at their individual discretion.
thus, science and engineering budgets have almost always been the ones sacrificed (The Economist, October 2, 1985, p. 94). Moreover, since more than £1,150 million of taxpayers' money has been used to pay higher education's operating costs and teaching bills, payrolls have become the first means of reduction. Unfortunately, the technically-oriented professors targeted have seen the writing on the wall, and many have left their ivy-covered British laboratories for foreign industrial careers. Left behind all too often have been their mundane, average, and generally unemployable colleagues (The Economist, October 2, 1985, p. 94).

Recently an ad hoc government committee chaired by Sir Alec Merrison investigated the demise of scientific and engineering research in higher education. The committee discovered that not only have physics, chemistry, and engineering departments in several institutions not been given increases in more than ten years, but also that as a result of recent budget cuts there are neither plans nor cash to appoint new staff members for at least the next twenty years. In response, the largest of Britain's five national scientific research councils, the Science and Engineering Research Council (SERC), promised to provide generous cash doles to institutes of higher education; but this will come at the expense of funds from their own labs and observatories. Even worse, what has often happened is that the money has been channeled into "cheaper science"—paid to professors "who want to philosophize about the origins of the universe rather than those who want to develop robotics and microelectronics laboratories" (The Economist, October 2, 1985, p. 95). As a result, British scientific research has become only "profound" but not sufficiently "profane."

VII. Multinational Investment Considerations

This pedantic attitude in Great Britain toward scientific research and education and training in applied sciences in general has become pertinent as interest grows in the industrial world for cost-effective multinational manufacturing. It has been in such a world that Great Britain has often been overlooked due to its lack of skilled technicians who do not merely design but are also capable of manufacturing and assembling products. Although a great deal of technological research has been done in British laboratories of United States-based firms, the new technology has often been transferred back to the U.S. parent for profitable application. Economists Edwin Mansfield and Anthony Romeo have reported that United States firms now spend 10 percent of their research and development expenses overseas; however, data from 29 overseas laboratories in seven industries have shown that an average of 47 percent of the R&D expenses has been spent on technology which has returned to the United States. The British have simply not been able to capitalize on their own ideas (Research Management, November-December, 1984, pp. 2-3).

VIII. Conclusion

Britain in the 1980s still reflects in many ways the attitudes of the Victorian era. Although some of the positive legacies of Victorian Britain have been carried into the contemporary world, many of contemporary Britain's problems have resulted from the application of Victorian solutions to a twentieth-century society. The fact that modern Britain has merely made a compromise between its traditional social structure and its economic and intellectual potential has provided a pertinent comment on the stagnation of the country's pace of change; such idleness has been felt most painfully in Britain's higher education system.

There is a shortage of 2.5 million technically-skilled and management-oriented workers in Britain today; for only 33 percent of British teenagers graduate from high school, compared to 74 percent in the United States and 95 percent in Japan (Frey, p. 13). Unless a more efficient, imaginative, and productive workforce is soon trained in Britain, the consequences for its economy are grim to contemplate. It must be recognized that neither a traditional vocational education nor a liberal arts program can give sufficient career prepara-
tion for jobs of the future. The longstanding notion that vocational-technical training has prepared one only for the crafts or for mechanical tasks must be abandoned, while liberal arts disciplines must go beyond the arts and letters and require knowledge of computer science, lab techniques, and electronics.

Industry must actively support education by cooperating with government and academia to develop effective training curricula and to expand in-house job training and re-training programs. In addition, there must be emotional as well as monetary support for corporate employees who return to schools as teachers and to engineering-college faculty who go into industry to become familiar with new industrial technology. The future strength of the British economy is inextricably bound to the vitality of technological innovation and is dependent upon the country’s higher education and training programs. Unless there is a social and psychological evolution of traditionally prejudiced educational values and goals, the technologically-linked economy of Great Britain will continue its spiral of deterioration.

REFERENCES


