Professional education, a study of the factors that influence the education of professional engineers in New South Wales.

Author:
Graycar, Adam

Publication Date:
1973

DOI:
https://doi.org/10.26190/unsworks/6377

PROFESSIONAL EDUCATION: A STUDY OF THE FACTORS THAT INFLUENCE THE EDUCATION OF PROFESSIONAL ENGINEERS IN NEW SOUTH WALES

by

Adam Graycar

Thesis presented as requirement for
the Degree of Doctor of Philosophy
in the School of Political Science,
The University of New South Wales.

August 1973

TABLE OF CONTENTS

Page

ABSTRACT

It is often thought that the structure and content of a professional course is determined by those in the educational institutions. The present thesis examines the proposition that educational policy in the professions, specifically in engineering, is subject to a wide range of non-academic influences. In addition to those within the universities and colleges, a number of bodies outside the educational institutions have an interest in the production of a professional.

The thesis shows how decisions in a supposedly autonomous institution (a university or a college of advanced education) are made. The decisions are not always made solely on the basis of academic criteria and within the formal structure of authority, but often reflect informal contact among the various actors. The interests of the actors are often presented informally and indirectly to the decision makers.

The thesis examines the factors that influence the making of policy in professional education in the light of:

a) the production of a professional;

b) the interests and actions of the professional association whose interest concerns the attainment and maintenance of a high status, and sees status as attainable through higher education;

c) the interests of Government which (i) provides finance for the binary higher education system, and (ii) sets rather general conditions within which the educational bodies must operate;

d) the interests of "industry" which employs the graduate and which also depends on suitably trained graduates; and

e) conventional and realistic views of academic autonomy.

In addition to critical examination of the literature in the fields of organizational studies, power and influence theory, sociology of professions, and public and educational administration, empirical material was gained from:

a) documentary evidence related to each of the actors;

b) interviews with (i) university academics in engineering, (ii) college of advanced education academics in engineering, and (iii) high ranking engineers in industry;

c) a questionnaire sent to a sample of engineers in industry.

STATEMENT

This thesis does not incorporate, without acknowledgement, any material previously submitted for a degree or diploma in any university; and to the best of my knowledge and belief, it does not contain any material previously published or written by another person except where due reference is made in the text.

ACKNOWLEDGEMENTS

I should like to express my gratitude to Professor F.M. Katz for the valued supervision, guidance and encouragement he provided during the writing of this thesis, and to Professor O. Harries who read drafts and provided valuable critical comment.

My debt extends to many of the people about whom this thesis revolves - to the engineers who completed the questionnaire, to those in industry, the Institution of Engineers, Australia, and also the academic engineers who, although invariable busy, found an hour or so to talk to me.

In order to present footnotes and bibliographical items as clearly and economically as possible, a number of style manuals were consulted, and the format suggested in Anderson, J., Durston, B.H., and Poole, M. 1970. <u>Thesis and Assignment Writing</u>. Sydney: John Wiley & Sons, was followed.

ABBREVIATIONS

A.C.A.E.	Australian Commission on Advanced Education
A.E.B.	Advanced Education Board (N.S.W.)
A.U.C.	Australian Universities Commission
C.A.C.A.E.	Commonwealth Advisory Committee on Advanced Education
CAE	College of Advanced Education
I.E.Aust.	Institution of Engineers, Australia
N.S.W.I.T.	New South Wales Institute of Technology
U.N.S.W.	University of New South Wales
V.C.A.C.	Vice-Chancellor's Advisory Committee (U.N.S.W.)

"Industry" is used throughout this work as it was by the C.A.C.A.E. viz. "as a convenient short term to cover primary and manufacturing industry, commerce, government and community services."

Unless otherwise specified, "Government " refers to the general institution of government and includes both the Commonwealth and State Governments in Australia.

CHAPTER I

INTRODUCTION

This thesis argues that educational policy in the professions, specifically in engineering, is subject to a wide range of non-academic influences.

Certain traditional views of higher education focus on the concept of a community of scholars endowed with complete autonomy, remote from the real world, and pursuing the goal of learning and inquiry for its own sake. To suggest that this situation still exists is unrealistic, although many academics still subscribe to a view of learning for learning's sake in an ivory tower atmosphere. When a similar comment is made about professional education, it is dismissed out of hand. Very frequently professional education is referred to, not as "education" but as "training". The student is trained to develop certain skills to permit him to play a certain occupational and social role. Professional and non-professional education exist side by side in tertiary institutes, are financed in similar ways, but are very different in their orientation. Those professionals who see professional education as just another form of liberal education are very much in a minority.[1] Policy making in non-vocational tertiary education is ideally, based on academic criteria. The major non-academic criterion is the availability of finance. In professional education, however, other non-academic criteria are relevant.

It is generally held that the educational programmes of any educational institution i.e. what is taught and how it is taught, are determined by those in the educational institutions. It is the teachers, it is held, who have the responsibility for designing and implementing an educational programme, a university course leading to a degree, or a programme leading to an award from a college of advanced education. Are these course decisions made by the teachers, are they made within the educational institution, thus reflecting a high degree of

---

1. This assertion is based on the author's reading of relevant journals; on interviews carried out with engineers; on the work of Balabanian (see Bibliography): and on that of P. Milner and C.J. Pengilley. 1972. Technology and Technical Education in Australia - An Introduction. Melbourne: University of Melbourne, Department of Mechanical Engineering. Studies in Technology and Science I; on discussions with Milner and Pengilley. See also J.V. Baldridge. 1971. Power and Conflict in the University. New York: John Wiley & Sons. Figure 7.8, p.121.

autonomy, or are other interests important in the determination of course structure and content?

Are the decisions on courses in fact dictated by the requirements and expectations of others - by Government, by future employers, by professional associations? Does autonomy exist within a system of professional education or are there limits to autonomy? Are there limits which circumscribe freedom, but within which the decision makers are relatively free? The object of this thesis is to assess this rather complex set of questions.

Professional education involves at least two complex organizations - a university or college, and a profession into which the students eventually pass. Both a university (or college) and a profession can be described as complex organizations[2] in that they are "social units deliberately constructed and reconstructed

---

2. See for example, P.M. Blau and W.R. Scott. 1963. Formal Organizations - A Comparative Approach. London: Routledge and Kegan Paul, p.2 and p.45; E. Gross. 1968. Universities as organizations: a research appraisal. American Sociological Review. 33, pp. 518-544; Baldridge, op.cit., passim.

to seek specific goals".[3] While there may not, at times, be clear specification of, and general agreement about the goals, one of the major functions, nevertheless, of the universities and colleges is to provide an education for its members, and one of the major functions of a profession is to increase and maintain the status of its members. To do this there are intricate administrative networks.

Both the educational bodies and the profession see the other as important in the attainment of their objectives. Upon graduation most students enter a profession and play their occupational roles accordingly. The universities and colleges then, are producing <u>professional employees</u> and thus the interests of the profession and of the employers are factors that must be considered by the educational bodies. What implications does this have for academic autonomy?

On the other hand, the profession sees the universities and colleges as important in conferring status on their members. Certain occupations have over time had high professional status and have had a university

---

3. A. Etzioni. 1964. <u>Modern Organizations</u>. Englewood Cliffs, New Jersey: Prentice-Hall. p.4.

education to achieve this, especially medicine and law. Other occupations had for many years existed outside the universities but have come to accept a university qualification as legitimating and raising their status. As a university (or college) degree can raise an occupation's status, it is in the interest of the profession to ensure that the course of study leads to an award which will be recognized by employers in particular, and the community in general. Furthermore it is in the interest of the profession to see that those who do not have this particular qualification are not identified with the profession. It is in the interest of the profession then, to try, as much as possible to ensure that the course has special characteristics - that it appear difficult and demanding, and that it be of a prescribed length.

In hypothesising

(1) that educational policy in the professions is subject to non-academic interests and values;
(2) that the status seeking of a professional body becomes an important determining factor in educational policy making;
(3) that the interests and actions of Government are determinants in educational policy making; and

(4) that the interests of industry are determinants in educational policy making;

the thesis will show how the policy making process is expected to work, how, in fact it does work, and how the interests are incorporated either formally or informally, directly or indirectly into the decision making process.

In order to examine these hypotheses the system of engineering education in New South Wales will be examined. The focus will be on engineering education and those who provide this education (academics in engineering departments in universities and colleges, and also the educational bodies themselves), and those with whom they interact - <u>industry</u> (the community for whom the graduates are produced); <u>The Institution of Engineers, Australia</u> (the professional association); and <u>Government</u> (the providers of resources).

Students will not be studied in this work as, to date, students have been regarded as a minor, if not negligible part of the bargaining and education process. It has not been possible, of course, to deal with <u>all</u> the factors which influence the education of professional engineers in New South Wales. An attempt to do so would be presumptuous in the extreme for it would necessarily involve among other things, a study of technological change, of the position of the engineer in society, and of the student movement. It is hoped that a thorough knowledge of the factors which have been chosen will increase understanding of the education of professionals. (This thesis takes no account of events that have occurred since the end of 1972).

This work will describe the setting in which, and the process by which decisions relating to professional engineering curricula are formally made. It will describe the interests and value orientations of those who are directly involved in engineering education either as provider of the education, as provider of the resources for the education, as consumer of the finished product, or as the finished product itself.

This description will set the stage for an analysis of:

(a) the formal structure of decision making authority;
(b) the social conditions relevant to, and the values dominating professional education;
(c) policy making in professional engineering education;
(d) academic autonomy.

The thesis opens with a description of the setting. Chapter Two raises the issues and mentions some of the arguments relating to the "proper" role of a university.

There are those who argue that a university, existing in a social environment, must perform in conformity with that environment's expectations. Others argue that the university must remain detached and view society's problems from a distance, so that it might understand them more dispassionately. Some critics see Australia's universities as exceptionally utilitarian and express concern that this utilitarian aspect makes the universities subject to a variety of pressures. To these people, non-academic pressures are certainly a problem. To understand the nature of professional education it is important to understand the term "profession". This is also discussed in Chapter Two.

Chapter Three introduces the concept of a "professional engineer" and some of the problems and conflicts inherent in making provision for the attainment of this status. One of the major interests of the engineering profession is its desire to control the means by which one can qualify to join its ranks. In engineering there have been several ways in which one can join the profession, and this raises a number of questions about length of courses, content of courses, how these courses should be presented, the controls over training, and accreditation.

With the general issues established, Chapter Four describes the formal setting for the making of academic policy in the two educational institutions under consideration, the University of New South Wales, and the New South Wales Institute of Technology. A description of the policy making process shows there are elaborate procedures governing this process. There are very clearly specified hierarchies through which any decision can be traced. Furthermore there are structures for the accommodation of non-academic interests, and in this setting the question of autonomy is first raised.

Chapter Five discusses the concept "autonomy" and develops a framework for the examination of the way in which interests are presented to the educational bodies. Three different methodological approaches are considered and interest group theory is the approach that is used.

The next three chapters deal with the three major actors, each of whom has an interest in the education of professional engineers. It is these interests, it is argued, that help determine what goes into an engineering curriculum. Chapter Six examines the interests and actions of Government, the provider of finance. Chapter

Seven deals with the professional body, The Institution of Engineers, Australia and Chapter Eight deals with the employer of the graduate - industry.

The interests of these bodies do not always coincide with the interests of the academics who are responsible for determining the general nature and details of the courses, and then ultimately teach them. Chapter Nine examines the academics' evaluation of the interests and actions of the bodies discussed in Chapters Six, Seven and Eight. From interviews it was found that nearly all respondents stated that non-academic interests affected college of advanced education courses, and just over one half thought this was the case in the university. Most university respondents however, were unwilling to admit that their courses were being directly influenced from outside the university. This leads to the conclusion that much of the influence that is brought to bear is often informal, and not often perceived by the academics as influence.

Chapter Ten provides an analytical overview of the interests of all concerned, and of the styles and channels of interest articulation as it exists in professional engineering education in New South Wales. Chapter Eleven states the final conclusions and indicates some areas for possible future research.

CHAPTER II

HIGHER EDUCATION FOR THE PROFESSIONS

INTRODUCTION

To begin to discover whether educational policy in the professions is subject to non-academic influences, attention must be focused on the educational process in our society and on the broad setting within which educational decisions are made. This chapter shows how one can qualify as a professional engineer in Australia, discusses the setting within which this takes place, and raises a number of questions about the end-product of the educational process, the professional, especially how the professional is produced.

BACKGROUND

In Australia one can qualify as a professional engineer in a number of ways.

(i) University courses

A four year full time university course leads to the degree of Bachelor of Engineering. Part-time courses of at least six years duration leading to a Bachelor of

Science (Technology), Bachelor of Science (Engineering) or Bachelor of Engineering degree are available in some universities.

Degree courses have been available in Australia since 1883 (see time chart, Appendix B). All universities require that engineering students do a certain amount of practical training in approved employment during the course. A university degree from any of the Australian universities satisfies the educational requirements for corporate membership of the major accrediting and professional body, The Institution of Engineers, Australia. (Some of the newer courses are accorded only provisional recognition - see Appendix H for a full list of universities and specialties).

(ii) <u>College of Advanced Education courses</u>

One can undertake a three or four year full time post-matriculation course leading to an Associateship or Fellowship Diploma, or a Bachelor of Technology degree. There are also five and six year part-time and sandwich courses which lead to a diploma or degree. (See Appendix C on the minimum length of engineering courses).

44% of Australian engineers have qualified by way of technical college or college of advanced education courses.[1]

Although professional engineers have been trained in institutions such as the Royal Melbourne Institute of Technology (founded as the Working Men's College, Melbourne, in 1882) and the Sydney Technical College (founded in 1878 as the Working Men's College, Sydney) and others, the colleges of advanced education, established following the report of the Martin Committee[2] now play a major role in the education of engineers. (See Appendix H for a full list).

(iii) Examinations of The Institution of Engineers, Australia

Until 1971 engineers could qualify by obtaining an exempting qualification (a degree or diploma) or by taking the examination of The Institution of Engineers, Australia. A comparatively small number of engineers

---

1. Surveys of engineers in Australia carried out by the former Department of Labour and National Service are published in the Journal I.E.Aust. 1966. 38, pp.N5-N12 and Journal I.E.Aust. 1972. 44,(7-8), pp.21-24.

2. Tertiary Education in Australia. 1964. Volume 1. Canberra. Report of the Committee on the Future of Tertiary Education in Australia [Martin Report]. Chapters 5 and 6.

has qualified in this way[3] and the Institution has discouraged students from attempting the examination.[4]

From November 1958 to 1971 the Institution's examination was available only to those who were unable to qualify in any other way. The Institution would not admit as candidates those who could not show good cause why they could otherwise not obtain an exempting qualification.[5] Since 1971 the examination has been held only "to determine the adequacy of overseas qualifications which the Institution is otherwise unable to assess. There is no other purpose for the Examination of the Institution".[6]

---

3. In the last year in which details were available (1966), twelve candidates passed the examination. Since then, the author was told in an interview with an I.E.Aust. official, the number has dwindled! For details until 1966 see B.E. Lloyd. 1968. The Education of Professional Engineers in Australia. (3rd ed.). Melbourne: The Association of Professional Engineers, Australia, p.61.
4. *ibid.*, p.61-62. This point was also made in the interview referred to in footnote 3.
5. Journal I.E.Aust. 1957. 29, p.162.
6. Rules of Examination. Form no. 11 of The Institution of Engineers, Australia, June 1971.

(iv) Local Government Examinations

In four states of Australia, legislation requires that engineers in various local government capacities shall be holders of appropriate engineering certificates or qualifications. Examining Boards which provide engineers with local government certificates have been set up in N.S.W., Victoria, Queensland and South Australia. These boards make provision for exemption or partial exemption for those who possess professional or other engineering qualifications. Possession of a Local Government Certificate does not necessarily signify complete acceptance by The Institution of Engineers, Australia. (Again, see Appendix H).

In a 1965 survey carried out by the then Department of Labour and National Service it was found that 44.2% of Australian engineers had a diploma as their highest qualification. 51% had a university degree and 4.8% had other qualifications.[7]

The educational institution then, is central to

---

7. Journal I.E.Aust. 1966. 38, p.N10, Table VII. See also Appendix I, below.

the system of engineering education. It is the training institution and the dispenser of knowledge, and, it will be shown, the focal point of social, political and industrial values and aspirations. Before the decision making process within the educational bodies can be examined in relation to the questions posed in Chapter I, it is necessary to describe the social setting within which higher education exists.

HIGHER EDUCATION

There has been an enormous volume of literature discussing "ideal type" and "realistic" descriptions of the role of universities and colleges.[8] Seldom do writers argue that the traditional concept of a university, namely that of a community of scholars pursuing learning for its own sake, is a realistic description of the position today.[9] A committee inquiring into higher education in New South Wales saw universities all over the world "sharing traditional values and purposes", but concluded that to some extent their nature is determined

---

8. For example, see the bibliography of C. Jencks and D. Riesman. 1969. The Academic Revolution. New York: Anchor Books. pp.545-558.

9. Z. Cowan. 1972. The role and purpose of the university. In G.S. Harman and C.Selby-Smith (Eds.). Australian Higher Education. Sydney: Angus and Robertson. Cowan discusses some ideals of a university on pp.15-17.

by the social structure in which they operate.[10] It is fashionable, when discussing the university to speak of the "traditional values and purposes", though seldom do they receive any attention other than their cursory inclusion.

L.N. Short rejects the notion that the proper end of education is education for its own sake[11] and agrees with R. McCaig who argues that a university is a social institution and as such, must be responsive to its environment.[12] Short maintains however, that "the Australian university has not yet determined its relationship to the society which supports it."[13]

There is very little currency for the view that the university should exist in an aloof, exclusive, ivory

---

10. The First Report of the Committee Appointed by the N.S.W. Minister for Education to Inquire into Various Aspects of Higher Education in New South Wales. 1961. Sydney: Government Printer. paras. 2-3.

11. L.N. Short. 1967. Changes in higher education in Australia. The Australian University. 5, p.41.

12. R. McCaig. 1967. Institutional changes in British universities: reactions to social pressures. The Australian University. 5, p.74.

13. Short, op.cit. p.13.

tower atmosphere. In contrast to those who argue for a distinctly utilitarian "service station" university, there are those who, while they acknowledge that a university is a social institution, maintain that it can best serve the long term interests of society by concentrating on its own distinctive, and self-chosen work.

James Perkins sees a university as dealing with acquisition, transmission and use of knowledge, namely research, teaching and public service.[14] The view that the university exists largely to provide public service is frequently discussed[15] and one major conclusion is that a situation has developed where the economy is geared to, and dependent upon its investment in education.[16]

Carl Davidson maintains that the universities, or knowledge factories, as he calls them, have become mere testing services for private enterprise and government in the way they train and test future personnel for industry.[17] Many metaphors have been used to describe

---

14. J.A. Perkins. 1966. The University in Transition. Princeton, N.J.: Princeton University Press.
15. J.J. Corson. 1967. If not the university? Educational Record. 48, 153-7 explains why there has been this demand on the university for public service.
16. L. Morey. 1961. The State Supported University. Carbondale, Ill.: Southern Illinois University Press. p.13.
17. C.Davidson. 1967. University reform revisited. Educational Record. 48, pp.5-10.

the university e.g. "multiversity", "springboard", "mould", "mammoth cave", "zoo", "dispensing machine" etc.[18]

Discussions of the functions of a university are immersed in controversy, and even with this cursory survey it can be seen that there are varying expectations about the role of higher educational bodies. The policy makers in higher education do not operate in a vacuum, and it can be assumed that decisions made reflect, to some extent, the policy makers' views of the proper role of higher education.

AUSTRALIAN HIGHER EDUCATION

In Australia, tertiary education is seen as an economic investment[19] in that arguments for primary and secondary education have been political, but arguments for tertiary education have been economic.[20] Professor P.H. Partridge sees Australian universities as

---

18. C.H. Monson. 1967. Metaphors for the university. Educational Record. 48, pp.22-29.

19. P.H. Partridge. 1965. Tertiary education - society and the future. In J. Wilkes. (Ed.). Tertiary Education in Australia. Sydney: A.I.P.S. and Angus and Robertson. p.6.

20. ibid.

"exceptionally utilitarian".[21] This is due, he says, to the character of the society they serve.[22] "It is not rash to assume that the universities will find themselves more and more being expected to conform to someone's conception of the public interest".[23] Sir Philip Baxter, former Vice-Chancellor of the University of New South Wales believes "the university exists only to serve the community".[24] Professor S. Encel sees one role of the university in producing a governing elite for the community.[25]

As Government in Australia is the largest employer of university graduates[26] it could be argued that Government, as provider of finance and employer, should be in a position to dictate what is taught inside the

---

21. P.H. Partridge. 1968. Society, Schools and Progress in Australia. London: Pergamon Press. p.129.

22. ibid.

23. P.H. Partridge. 1963. Australian universities - some trends and problems. The Australian University. 1, p.24.

24. Baxter quoted by W.F. Connell. 1959. The development of universities in Australia. The Yearbook of Education 1959. London. p.96.

25. S. Encel. 1965. The social role of higher education. In E.L. Wheelwright (Ed.). Higher Education in Australia. Melbourne: Cheshire. pp.6-11.

26. ibid.

universities, and how it is taught. This is contrary to the ideal of university autonomy which sees university activities determined largely within the university and not subject to any undue outside pressure. Partridge says that universities have been suffering a steady loss of autonomy during the past two decades or so.[27]

> ... there has [not] been any great interferences with the intellectual freedom of university teachers or with the formal autonomy of the universities themselves ... the point [is] that our universities have more and more lost control over the external conditions - conditions which have been changing their character, their function and the conditions of their work. They have become public utilities ... expected more and more to shape their teaching, professional training and research to serve important ends of public policy. [28]

While academics like Partridge and Encel[29] point to the undesirability of extreme utilitarianism or vocationalism, a study of "The University and its Community" carried out in Sydney in 1964 shows that the

---

27. P.H. Partridge. 1962. The university system. In E.L. French. (Ed.). Melbourne Studies in Education 1960-1. Melbourne: Melbourne University Press. p.56.

28. ibid.

29. Partridge, op.cit.; P.H. Partridge. 1965. The Martin Report. Vestes. 8(2), pp.71-81; Encel, op.cit.; S.Encel. 1965. Science, education and the economy. The Australian University. 3, pp. 54-73; S.Encel. 1965. Politics and resources for tertiary education. In J. Wilkes. (Ed.). op.cit. pp.148-163.

community sees the universities overwhelmingly in vocational and professional terms rather than in "cultural" terms.[30] This perception is reasonable because the universities do, in fact have a strong vocational emphasis.[31] The role of the universities was seen by the Murray Committee[32] as being vital to community improvement (Murray Report - paragraph 2) and providing training for people to serve the community (Murray Report - paragraph 3).

As well as these specific functions designed largely to achieve economic growth, the university can be seen as a centre for social examination and evaluation. While more emphasis is placed on the former in Australia[33] there are structures and practices in Australian universities designed to plan for and achieve both types of objectives. Nevertheless most higher education programmes are designed to produce a person who, upon graduation, enters a profession.

---

30. H. Philp, R.L. Debus, V. Viedemanis, and W.F. Connell. 1964. The University and its Community. Sydney: Ian Novak. p.48.
31. See, for example, table on p.46 of ibid. See also university handbooks.
32. Report of the Committee on Australian Universities. 1957. Canberra: Government Printer. [Murray Report].
33. See for example, Encel. 1965. Science, education and the economy, op.cit.; Encel. 1965. The social role of higher education, op.cit.; Partridge. 1962. op.cit.

Those with an interest in professional education expect the educational system to turn out a product with certain "professional" characteristics. An understanding of the concept "profession" is necessary for an understanding of "professional education".

THE CONCEPT "PROFESSION"

Much of the sociological writing in this field has been concerned with three major themes

(a) a definition - or at least a search for the characteristics that make up the concept "profession";

(b) description and analysis of the process of professionalization i.e. the process by which an occupation develops into and achieves the status of a profession;

(c) the conflict between professionalization and bureaucratization.

In this chapter there is no attempt to arrive at a single, concise, unambiguous definition of the concept.

Many authors have attempted this,[34] others have summarized many of these attempts,[35] while others have written of this as a sterile exercise.[36]

---

34. See for example: E. Greenwood. 1962. Attributes of a profession. In S. Nosow and W.H. Form (Eds.). Man, Work and Society. New York: Basic Books. p.207; W.J. Goode. 1969. The theoretical limits of professionalization. In A. Etzioni (Ed.). The Semi-Professions and their Organization. New York: The Free Press. p.276-7; M.L. Cogan. 1953. Towards a definition of profession. Harvard Educational Review. 23, p.48-9; B. Barber. 1963. Some problems in the sociology of the professions. Daedalus. 92, p.672; A. Flexner. 1915. Is social work a profession? School and Society. 1, pp.901-911; T. Leggatt. 1970. Teaching as a profession. In J.A. Jackson (Ed.). Professions and Professionalization. Cambridge: Cambridge University Press. pp.155-6; M.D. King. 1968. Science and the professional dilemma. In J. Gould (Ed.). Penguin Social Science Survey 1968. Ringwood, Victoria: Penguin. p.38; E.C. Hughes. 1963. Professions. Daedalus. 92, p.655.

35. D.J. Hickson and M.W. Thomas. 1969. Professionalization in Britain: A preliminary measurement. Sociology. 3, p.38; H.S. Becker. 1962. The nature of a profession. Yearbook of the National Society for the Study of Education. Chicago. 61, (Part II), pp. 31-5; M.L. Cogan. op.cit., pp. 33-50; G. Millerson. 1964. The Qualifying Associations: A Study in Professionalization. London: Routledge and Kegan Paul. pp.4-5; A.Kleingartner. 1967. Professionalism and Salaried Worker Organization. University of Wisconsin: Industrial Research Institute. p.10.

36. R.W. Habenstein. 1963. Critique of 'profession' as a sociological category. Sociological Quarterly. 4, pp.291-300; H.Jamous and B.Peloille. 1970. Professions or self-perpetuating systems? In J.A. Jackson (Ed.). op.cit. p.138; M.L.Cogan. 1955. The problem of defining a profession. The Annals of the American Academy of Political and Social Science. 297. pp.105-111.

It has been argued that any definition or even any common denominator may lack means of empirical substantiation.[37] It has also been argued that "profession" as a sociological category is untenable in that while it involves patterns of organized action and ideological rationalizations, the literature in the field shows it does not have the status of a concept with "analytical power describing a limited number of characteristics whose relations and order are demonstrable".[38] Howard Becker constructs an ideal type model of a profession and then shows how professions in reality and professional education differ very markedly from this ideal.[39]

Definitional Characteristics

Notwithstanding this sort of criticism it will be of value to list and describe some of the commonly accepted characteristics. In dealing with similar sorts of criticism Carr-Saunders and Wilson say that the term profession "nevertheless ... clearly stands for something. That something is a complex of characteristics. The

---

37. Hickson and Thomas. op.cit. p.37.
38. Habenstein. op.cit. p.298.
39. Becker. op.cit.

acknowledged professions exhibit all or most of these features. It will be a sufficient defence of our procedure to note very briefly the characteristics of these vocations occupying the central position".[40]

In looking for definitional characteristics, a number of papers which give or discuss definitions have been studied,[41] and one major criterion stands out - the

40. A.M. Carr-Saunders and P.A. Wilson. 1933. The Professions. Oxford: Oxford University Press.p.284.

41. Barber. op.cit.; Becker. op.cit.; J.Ben-David. 1963-4. Professions in the class system of present day societies. Current Sociology. 12, pp.247-330; L.Blauch. 1955. Education for the Professions. Washington: Government Printing Office. pp.1-8; Carr-Saunders and Wilson. op.cit.; Cogan. 1953., op.cit.; Cogan. 1955., op.cit.; Flexner. 1915., op.cit.; W.J. Goode. 1957. Community within a community: the professions. American Sociological Review. 22, pp.194-200; W.J. Goode. 1960. Encroachment, charlatanism, and the emerging profession. American Sociological Review. 25, pp.902-914; Goode. 1969., op.cit.; Greenwood. op.cit.; Habenstein. op.cit.; Hickson and Thomas. op.cit.; Hughes. op.cit.; J.A. Jackson. 1970. Introduction. In J.A. Jackson (Ed.). op.cit.; Jamous and Peloille. op.cit.; King. op.cit.; Kleingartner. op.cit.; Leggatt. op.cit.; W.J. McGlothlin. 1964. The Professional Schools. New York: The Center for Applied Research in Education Inc.; W.J. McGlothlin. 1960. Patterns of Professional Education. New York: Putnams and Sons; R.M. MacIver. 1955. The social significance of professional ethics. The Annals of the American Academy of Political and Social Science. 197, pp. 118-124; Millerson. op.cit.; T. Parsons. 1968. Professions. The International Encyclopedia of the Social Sciences. New York: The Macmillan Company and the Free Press. Volume 12, pp. 536-547; K. Prandy. 1965. Professional Employees - A Study of Engineers and Scientists. London: Faber and Faber; H.L. Smith. 1962. Contingencies of professional differentiation. In Nosow and Form. (Eds.). op.cit.,

(continued)

notion that a profession is built upon some basic theoretical knowledge. An understanding of that knowledge is central in any study of professions. Professional education is concerned with the transmission and application of this knowledge, but there is far more to "professional education" than the formal knowledge that is transmitted, as the list below shows.

In the literature seventeen definitional characteristics of the concept were found. Not all, of course, will be relevant. Not all were expressed in the same terminology. In the following list no attempt has been made to order them into any sort of hierarchy of importance.

1. A profession is based on learning and embodies generalized and systematic knowledge.[42]
2. The knowledge acquired over time is communicable via some sort of educational process.[43]

---

41. (continued) pp.219-225; R.W. Tyler. 1952. Distinctive attributes of education for the professions. <u>Social Work Journal</u>. 23, pp.52-62. Quoted in Becker. <u>op.cit.</u>; A.N. Whitehead. 1963. Quoted in <u>Daedalus</u>. 92, pp.647-9.

42. Flexner. <u>op.cit.</u>; Cogan. 1955. <u>op.cit.</u>, p.106; Carr-Saunders and Wilson. <u>op.cit.</u>, p.491.

43. Flexner. <u>op.cit.</u>

3. There is an intellectual base to this knowledge.[44]
4. The profession has certain <u>special</u> (as opposed to routine) skills. This gives it some form of authority.[45]
5. There is a sense of practicality in the performance of the profession. This practice however, is based on abstract knowledge and theory.[46]
6. The function performed is of vital importance to the community.[47]
7. There is a high level of community trust for the profession.[48]
8. There is a code of ethics.[49]
9. There is some sense of colleague solidarity - incorporating some sort of professional ethos or professional ideology.[50]

---

44. <u>ibid</u>.
45. King. <u>op.cit</u>., p.38; T. Parsons. 1949. The professions and social structure. In Parsons. <u>Essays in Sociological Theory, Pure and Applied</u>. Glencoe, Ill.: The Free Press. pp.185-199.
46. Cogan. 1953. <u>op.cit</u>., pp.48-9.
47. <u>ibid</u>.
48. Greenwood. <u>op.cit</u>., p.211.
49. Becker. <u>op.cit</u>.; MacIver. <u>op.cit</u>., p.121.
50. Goode. 1957. op.cit., p.194; Habenstein. <u>op.cit</u>., p.297; Hughes. <u>op.cit</u>., p.655; Greenwood. <u>op.cit</u>., pp.214-6.

10. There is a strong service ideal.[51]

11. The service ideal is often based on altruism and rewards are not merely material but also derive from the performance of service.[52]

12. There is a high level of social prestige.[53]

13. Profession may be a class or status concept and may display certain sub-cultural characteristics.[54]

14. Professions are organized.[55]

15. Professions have a degree of control over entry to the profession, training, licensing, certification, accreditation and standards of practice.[56]

---

51. Goode. 1969. op.cit., pp.276-8; H. Wilensky. 1964. The professionalization of everyone? American Journal of Sociology. 70, 137-158.

52. Barber. op.cit., p.672; Becker. op.cit., p.28; King. op.cit., p.38.

53. A.A. Congalton. 1969. Status and Prestige in Australia. Melbourne: Cheshire. p.56; G. Harries-Jenkins. 1970. Professionals in organizations. In Jackson (Ed.). op.cit., pp. 79-81.

54. Ben-David. op.cit., p.248; T.H. Marshall. 1965. Class, Citizenship and Social Development. New York: Anchor Books, Doubleday & Company. Chap. VI; Jamous and Peloille. op.cit., pp.138-9; Goode. 1957. op.cit.

55. Becker. op.cit., p.28; Leggatt. op.cit., p.156; Millerson. op.cit., passim.

56. Goode. 1957. op.cit., p.194; Becker. op.cit., p.36; McGlothlin. 1964; op.cit., p.5.

16. There is a monopoly of practice and ideally a monopoly of skills.[57]

17. The professions have a certain degree of autonomy.[58]

The seventeen characteristics listed here cover the two most common "models" of professions generally applied, namely the "functional model" and the "process model". The functional model stresses the "community" aspect of a profession and the unifying aspect of professional education. Selection and socialization of students is deemed crucial as care and attention here ultimately leads to great homogeneity of the profession, especially with respect to goals and ends, and this is achieved because of a sense of common spirit resulting from a common educational and socialization experience.[59]

The "process model" focuses on diversity within the profession, especially regarding ideology and goals.[60]

---

57. Goode. 1957. op.cit., p.195; Becker. op.cit., p.36; McGlothlin. 1964; op.cit., p.5; Ben-David. op.cit., p.250.

58. Goode. 1969. op.cit., p.291; F.E. Katz. 1968. Autonomy and Organization. New York: Random House.

59. Goode. 1957. op.cit., typifies this approach.

60. R. Bucher and A. Strauss. 1961. Professions in process. American Journal of Sociology. 66, pp.325-334; H.L. Wilensky. op.cit., pp.137-158.

Perrucci and Gerstl see professions here as "internally differentiated, with subgroups engaging in power fights involving the nature of the profession and the legitimate activities of its practitioners".[61]

These models are not mutually exclusive, and in both there remains the fact that one profession is set apart from other professions and occupations on account of its specialized knowledge and its members' adherence to a set of professional norms and values. While one can draw up a list of "definitional characteristics" of a profession, it can be argued that profession is not so much a descriptive term, as one of value and prestige.[62] To call an occupation a profession raises its status and also the status of the members. Thus, argues E.C. Hughes, "the term 'profession' is a symbol for a desired conception of one's work and hence of one's self".[63]

Higher education has become one of the main ways of achieving highly desired professional status for an occupation. It is the task now to show the relationship between higher education and the end

---

61. R. Perrucci and J. Gerstl. 1969. Profession Without Community: Engineers in American Society. New York: Random House. p.6.

62. E.C. Hughes. 1958. Men and Their Work. Glencoe, Ill.: The Free Press, p.44.

63. ibid.

product, the professional, and particularly to examine the expectations a profession has of the educational process, and how the profession uses higher education to achieve its standing. Does an organized group with the characteristics listed above have sufficient resources to be able to influence the decision making process? In an attempt to answer these questions, the next Chapter deals with professionalization, in general, and the engineering profession in particular.

CHAPTER III

THE PROFESSIONAL ENGINEER AND HIS EDUCATION

INTRODUCTION

Before an examination of the decision making process in professional engineering education can take place, it is necessary to have a clear understanding of what a professional engineer is, and of the factors involved in professionalization. This will set the stage for discussion of the problems involved in attaining the status of a professional in general, and a professional engineer in particular.

Although great engineering accomplishments have been a feature of most eras, there were no engineering schools or courses until the 18th century and no form of professional organisation until the 19th century. The twentieth century has been called the century of the engineer, with large resources being devoted to the training and education of engineers and engineers taking credit for its many technological discoveries.

Compared with the old established professions such as Medicine, Law and The Ministry, engineering is a relatively new profession. The standing of engineering is regarded with some ambivalence; most authors regard it as a fully fledged profession, but a significant number see it as a new and in some cases, only partly developed, profession. The reasons for this arise largely from the fact that engineers can qualify in a large number of ways and most engineers are not university graduates. Any skilled mechanic can call himself an engineer and many who call themselves professional engineers resent this. In engineering periodical attention is continually drawn to the fact that "engineer" is used so indiscriminately.

Over time there have been attempts to have "engineer" legally defined and subject to state registration (see below, Chapter VII). The Conference of Engineering Societies of Western Europe and the United States has adopted the following definition of "professional engineer".[1]

---

1. Quoted in J.E. Gerstl and S.P. Hutton. 1966. Engineers: The Anatomy of a Profession. London: Tavistock Publications. pp.4-5.

> A professional engineer is competent by virtue of his fundamental education and training to apply the scientific method and outlook to the analysis and solution of engineering problems. He is able to assume personal responsibility for the development and application of engineering science and knowledge, notably in research, designing, construction, manufacturing, superintending, managing and in the education of the engineer. His work is predominantly intellectual and varied and not of a routine mental or physical character. It requires the exercise of reciprocal thought and judgement and the ability to supervise technical and administrative work of others.

This definition, however, has been criticized by some engineers, largely because it gives the impression that the engineer is the follower, rather than the leader in the conquest of technology.[2] Other definitions are similar,[3] but to argue the relative merits of various definitions is not in order here.

The fact that engineers seek an unambiguous definition of their profession revolves around two points:

---

2. W.M. Evan. 1969. The engineering profession - a cross-cultural analysis. In R. Perrucci and J. Gerstl. (Eds.). The Engineers and the Social System. New York: John Wiley & Sons. p.108.

3. For example, see Lloyd. op.cit., pp.13-19.

(1) There is a high level of prestige associated with being a professional and professionals do not like to share this status with others who have had less training, a different training, and do different work;

(2) Because "engineering" covers so wide a range of activities there is disagreement over what sort (and amount) of education is necessary before one can be called a "professional engineer". If there were a clear definition, one could argue that there would be a fair guideline for engineering educators. In the United States the engineering accrediting body, the Engineers Council for Professional Development (E.C.P.D.) has its own definition of "engineer",[4] and the accreditation process uses this definition as a starting point.

---

4. "Engineering is the profession in which a knowledge of the mathematical and natural sciences, gained by study and experience and practice is applied, with judgement to develop ways to utilize commercially the materials and forces of nature for the benefit of mankind". Quoted in W.L. Everitt. 1971. Engineering education, an overview. <u>The Encyclopaedia of Education</u>. New York: The Macmillan Company and the Free Press. Volume 3. p.281.

Problems of definition have led to conflicts over accreditation and state licensing (particularly in the United States and Europe), over arbitration award payments (particularly in Australia) and to arguments within engineering schools over curriculum balance, especially over the balance of pure science, engineering science and humanities or liberal studies.[5]

These conflicts, which will be discussed below, are concerned largely with professionalization.

PROFESSIONALIZATION

The major usage of the term professionalization refers to a process by which an occupation becomes a profession i.e., the acquisition by the occupational group as a whole, of many or most of the above "definitional characteristics",[6] especially the raising of the occupation's status. The movement to professionalize an occupation has been seen as the expression of a desire for collective mobility on the

---

5. R.L. Eichhorn. 1969. The student engineer. In Perrucci and Gerstl. (Eds.). op.cit., pp. 146-151.

6. See for example: Jackson. op.cit.; Millerson. op.cit.; Hickson and Thomas. op.cit.; Wilensky. op.cit.; C. Turner and M.N. Hodge. 1970. Occupations and professions. In Jackson. (Ed.). op.cit., pp.17-50. These are some studies in which the term is used in this way.

part of some of the people in an occupation.[7] J.A. Jackson sees the process of professionalization as "a process of increasingly protective measures to define the boundaries between the sacred company of those within the walled garden and those outside".[8]

Higher education is the first step in the professionalization process. Onto the base provided by education are amassed a number of other characteristics. Below is a list of generally accepted characteristics of the process of professionalization.

1. The profession determines its own standards of entry and training.[9]
2. The student professional undergoes a socialization process.[10]
3. The profession seeks legal regulation and licensing of professionals.[11]

---

7. Hughes. 1958. op.cit., p.44.
8. Jackson. op.cit., p.10.
9. Goode. 1960. op.cit., p.903; Hughes. 1963. op.cit., p.658; Millerson. op.cit.
10. Goode. 1960. loc.cit.; D.S. Anderson and J.S. Western. 1972. Professional socialization. In F.J. Hunt. (Ed.). Socialization in Australia. Sydney: Angus and Robertson. pp. 288-306.
11. Goode. 1960. loc.cit.; Wilensky. op.cit., p.145.

4. Members of the profession seek to constitute licensing and admission boards.[12]

5. Members of the profession seek to shape legislation concerning that profession.[13]

6. The occupation gains in income, power, and prestige, and it can therefore attract good students.[14]

7. The practitioner is relatively free of lay evaluation and control.[15]

8. The terms of practice enforced by the profession are often more stringent than legal controls.[16]

9. Members are exceptionally strongly identified and affiliated with their profession.[17]

10. The profession is likely to be a terminal occupation.[18]

11. The training provided for the profession takes place in a formal setting - in a higher education institution.[19]

12. The occupation is followed on a full-time basis.[20]

---

12. Goode. 1960. loc.cit.
13. ibid.; Wilensky. op.cit., p.145.
14. Goode. 1960. loc.cit.
15. ibid.
16. ibid.
17. ibid.
18. ibid.
19. Wilensky. op.cit., p.144.
20. ibid., p.142.

13. A formal ethical code is developed.[21]

14. The occupation is recognized as a profession by those outside the occupation.[22]

15. Members conform to and internalize specific norms and values.[23]

16. A professional organization is formed, and this assumes a wide range of powers in social, educational, legal and political matters.[24]

Studies in professionalization often centre on "emerging" or "marginal" or "semi"-professions.[25] Semi-professions are characterized by less theoretical knowledge, and a less established background. This less established background may indicate less colleague solidarity, a weaker community ethos, a less defined and meaningful code of ethics, etc. A large number of members are usually women (nurses, social workers, librarians, school teachers) and semi-professionals generally are salaried employees working in bureaucratic organizations. It is in this area that many studies of the conflict between professionalization and bureaucratization have been made. This, however, is

---

21. _ibid._, p.142.
22. _Millerson._ op.cit., p.12.
23. _ibid._, p.10.
24. _ibid._, _passim._ Wilensky. _op.cit._, p.144.
25. See for example, Etzioni. (Ed.). 1969. _op.cit._; Jackson. _op.cit._; Barber. _op.cit._, p.676.

not a significant part of the present work.

In addition to the "semi-professions" are the "sub-professions". Professional engineers rely heavily on "sub-professionals" e.g. technicians and draughtsmen, and also on non-professional tradesmen. Educational objectives relating to these three levels in engineering have been clearly specified.

The objectives of professional engineering education have been stated as:[26]

(a) Integration of a broad background of basic and engineering sciences into a meaningful educational experience to develop the ability to apply knowledge pertinent to a substantial engineering discipline to the identification and solution of practical engineering problems within a branch of engineering.

(b) Development of a professional attitude and an appreciation of the role of the engineering profession in society.

(c) The award of a qualification recognized by the profession as fulfilling the academic requirements of professional practice.

---

26. Lloyd. op.cit., p.71.

One can qualify in the ways described above in Chapter II.

The objectives of Engineering Technician Education have been stated as:[27]

(a) Integration of applications of science and techniques of mathematics into a meaningful and relevant educational experience to develop the ability to apply knowledge pertinent to an identifiable technical discipline to practical problems within a technical speciality.

(b) Development of responsible attitude in keeping with the importance of the role of the technician in the engineering team.

(c) The award of a qualification identifiable as fulfilling the educational requirements for sub-professional employment.

Entrance to engineering technician courses is usually set at two years below matriculation, though in Victoria the tendency has been for entry at one year below matriculation. The duration of the course is commonly five years part-time or three years full time and the courses are taken in a technical college. The professional, it has been suggested[28] is sometimes

27. *ibid*.
28. In interviews with the author.

suspicious of what he sees as encroachment by a technician on the professional sphere. Over the years there have been complaints that there were not enough engineers to service industry and government and as a result, sub-professionals (technicians) have been doing professional work (unofficially, of course). The area of demarcation between professionals and sub-professionals is a matter of continual concern.

The objectives of Engineering Tradesmen Education have been stated as:[29]

(a) Essentially as an adjunct to on-job training during apprenticeship education directed towards the development of manual skills and a knowledge of tools, materials, practices and machines associated with a particular trade.

(b) As a prerequisite to licensing, the passing of trade proficiency examinations in theory and practice. When licensing is not required, the passing of examinations is not necessarily a condition to completion of apprenticeship.

Entry to tradesman status is via an apprenticeship which usually includes several years of on-the-job experience and training supplemented by technical

---

29. Lloyd. *op.cit.*, p.71.

college courses. While the tradesman is indispensible in engineering, his education is of no concern to the subject of this thesis.

It is the education of the professional that commands attention for in the production of a professional there is interaction between two organizations - the educational body and the profession. On the one hand the universities have traditionally seen themselves as autonomous bodies. The same traditions of autonomy do not apply to other tertiary education bodies. On the other hand the profession, in order to protect and increase its status, must concern itself with a broad range of educational issues, if in fact higher education is a means to that status.

Thus in a situation where each of these organizations must interact with the other, there is a potential conflict situation which may manifest itself in the policy making process. There may be a coincidence of interests, and then no conflict will result. Whether there is conflict or not will be examined below, but now attention must be turned to the sorts of questions that arise in planning and executing a professional engineering course.

SOME EDUCATIONAL ISSUES

The first ever formal engineering course started in Paris in 1747 and it was not until approximately 100 years later that formal courses started elsewhere in Europe and the United States. (See Engineering Education time chart, Appendix B). Until formal courses developed, the engineering student, like other professional students at that time apprenticed himself to a working practitioner. As courses developed these provided another channel for entry to the profession, either through part-time courses in mechanics institutes (or their equivalent) or in the universities. The University of Glasgow was the first university with an engineering course, starting it in 1840, and very shortly after Irish and then English universities offered engineering courses.

In Australia mechanics institutes were founded in the colonies in the 1820s and 1830s while engineering education started at Melbourne University in 1861, although a full chair of engineering was not established until 1879. In 1849 a Committee of the N.S.W. Legislative Council decided to have a chair of engineering as a foundation chair in the proposed Sydney University[30]

30. Sir Henry Barraclough. 1933. The engineering school in retrospect. Journal I.E.Aust. 5, p.310.

but it was not until 1884 that a chair was established there - although the teaching of engineering had begun in the previous year.

In 1972, professional engineers were being trained in ten universities and about 23 other tertiary institutes in Australia.

Even in the early years there was conflict over what should be taught. When the four year course in engineering was introduced at Melbourne University students were dismayed to find that for the first three years they had to do the Arts degree.[31] The sorts of problems that arose then, and arise now, relate to (i) the length of courses, (ii) the content of courses, and (iii) the type of courses.

(i) <u>Length of courses</u>

One important definitional characteristic of a profession is that the knowledge acquired over time is communicable through some sort of educational process. This transmission takes place over a number of years. What is the optimum number of years?

---

31. A.H. Corbett. 1961. The first hundred years of Australian engineering education. Journal I.E.Aust. 33, p.153.

By the time a university had been established in each state (1913) engineering courses had settled down to a four year full-time duration. This is still the pattern today although there has been some criticism of this being too short a period in which to teach a student to come to grips with fundamentals as well as aspects of massive technological change.[32]

The American Society of Engineering Education has recently published a major study entitled the Goals of Engineering Education[33] and one important recommendation was that the first qualification be a masters degree obtained after five years. Extending the course to five years in Australia has not met with great approval although individuals have in the past and for a number of reasons suggested lengthening Australian university courses. Other considerations aside, it appears that

---

32. See "Letters to the Editor". Journal I.E.Aust. 44 (June 1972), pp.23-4, one of which argues that engineering courses should be lengthened to five years. The other suggests courses should be reduced to 3 years. In interviews with engineers, the author found no real support for the notion that engineering courses be reduced in length.

33. Goals committee. 1968. Goals of engineering education - final report. Journal of Engineering Education. 58(5).

the supply of engineers will be greatly reduced if training is increased to five years. Non-university courses are in some cases only three years, but the I.E.Aust. has announced that from 1980 professional recognition will be given only to those who have completed at least four years of satisfactory full time study.[34]

In addition to its educational basis, course length is an important status determinant. Professional status is conferred after a course of study that takes several years. It is not seen to be something that is attained easily. The professional body has an obvious interest in course length. In attempting to specify the length of educational courses it is protecting its own status and indirectly limiting entry to the profession.

(ii) Content of courses

Members of the engineering profession strongly affirm the need to have a solid science based course, arguing that the engineer must understand the pure and

---

34. The announcement was first made in the Journal I.E.Aust. 1967. 39(1), p.N10. It is reproduced in Appendix C. See also the editorial in the Journal I.E.Aust., June 1972, p.3.

scientific fundamentals of his practice. It is further argued that if a course is overloaded with practical material much of this will soon become obsolete and unless the engineer has a firm grasp of principles he will not be able to adapt to change and thus will not be able to cope.

In the United States of America and Canada in the early 1950s engineering courses were approximately 25% mathematics and science, 45% engineering principles and 30% elective humanities and social sciences. Ten years later the percentages had changed to approximately 40, 30, 30 while in some schools it was 50, 0, 50.[35]

As there are people with different interests in what is to be taught, this is a major area of conflict and comments such as "the new graduate is too theoretical", "the new graduate can't do the work the employer expects of him" etc., highlight the issues that arise out of these differing interests.

A very different view is that subject matter is not terribly important. It has been argued that it

---

35. A.C. Gross. 1969. On engineering education and engineering students. Journal of Higher Education. 40, p.523.

matters very little what is taught in the course of study so long as the graduate has the right sorts of values and fits the professional sub-culture.

C. Jencks and D. Riesman hypothesise

> that the function of a professional school is not primarily to teach a narrowly defined set of skills of the kind measured by examinations, but to define a set of general criteria that recruits to the profession ought to meet, and to screen out those who do not measure up. ... If he does this [display the right sort of attitude] he gets through the course of study, otherwise he does not. He can always fill in the gaps in his professional knowledge once he is in practice. [36]

Analysis of the conflict over what should be taught is important, for it will highlight the interests of those who are concerned with professional engineering education.

(iii) Types of courses

About one half of Australia's engineers qualify through a university course and the other half through non-university courses. It has been suggested by some that the diploma is a poor man's degree, while others argue that a diploma and a university degree are quite

---

36. Jencks and Riesman. op.cit., p.206.

different, the holders of these respective qualifications being different sorts of engineers. It has also been argued that non-university institutions are not only necessary, but are better equipped to turn out the sort of graduate that industry requires. Their courses have a different emphasis from that in university courses, but are in no way inferior - just different. There is a place for the person, it is argued, who does only 75% of the full university course.[37]

While a great deal has been written on the binary system of higher education and professional education within the strata, questions can also be raised concerning the relationship between the profession and the educational bodies, especially with regard to the types of courses that are available.

In many professions university or college training is not accepted as a sufficient condition for entry to the profession.[38] In some cases the professions have educated and trained their own members. This has been the case with the engineering institutions (among others). As the universities have expanded, many professions have chosen to become associated with them. Many emerging

37. R.W. Parsons. 1956. The engineer and his education. Journal I.E.Aust. 28, p.89.

38. Millerson. op.cit., cites many examples.

professions have seen university affiliation as a status boost to their occupation and have moved to achieve a university degree as their professional qualification.[39]

C.E. Moorhouse sees the requirement of a degree for many professional courses as a serious drawback "since the professional institution is then in a position to lay down unduly exacting requirements about the degree and hence limit the University's freedom in an undesirable manner".[40] Engineering courses have been subjected to criticism from the I.E.Aust., from industry (see below), and also from academics such as Professor H.R. Vallentine who sees Australian university courses as "either static or evolving at a timid rate, the courses for the most part are inflexible, difficult and almost wholly technological; and the failure and wastage rates are unduly high".[41]

---

39. Some recent Australian examples include the attempt by the Real Estate Institute to have established a degree course in Real Estate at Macquarie University, Sydney - also, the recent successful example to give the military profession full degree status by awarding degrees of the University of New South Wales to graduates of the Royal Military College, Duntroon. (The Duntroon College in suburban Canberra has become the Faculty of Military Studies of the University of N.S.W. in suburban Sydney).

40. C.E. Moorhouse. 1960. Technical and technological education in Australia. Australian Journal of Education. 4, p.179.

41. H.R. Vallentine. 1968. Engineering education and the university. The Australian University. 6, p.182.

The profession has been described and some issues relevant to the professional education system have been raised. How are these issues of length, content and type of course communicated within the professional engineering education system - and what are the ramifications? These issues will be examined in terms of entry to the profession; professional organization; control over training; and control over licensing, certification and accreditation.

ENTRY TO THE PROFESSION

The importance of the relationship between the profession and the educational institution can be understood by examining the way in which entry to the profession is achieved, who makes the decisions regarding entry, and the basis upon which these decisions are made. The extent to which engineers can control entry to their profession will help determine the future status of the profession. Different elements within the profession might want different characteristics in their graduate, e.g., some might expect graduates to have more practical training than they have now - some might expect them to have less.

To become a full corporate member of the I.E. Australia, an engineer has to pass an approved course of study and do a post-graduate training period in an approved industry. Then one is eligible for real entry to the profession. The conflicts that arise here then relate to desirable qualities of students, to desirable content of courses and to acceptable training schemes.

One prominent writer has suggested that there are two basic aims of professional education:

(a) to supply enough practitioners

(b) to make sure they are competent.[42]

This raises the question of how can a profession limit itself to ensure there is not an oversupply, which would not be in the interest of practising professionals, and at the same time to ensure that there is a sufficient supply of competent graduates.

Do these problems of quality and quantity of graduates lie with the profession, or are they the problems of the universities and colleges? In the United States the pattern seems to be that professional schools, having obtained a monopoly for qualifying entrants for the profession have also assumed the obligation for supplying enough entrants.[43]

---

42. McGlothlin. 1960. op.cit., p.2.
43. McGlothlin. 1964. op.cit., p.22.

Entry to the profession is further related to the resources available for the training of professionals. The Commonwealth and State governments in Australia are the providers of finance for educational institutions and make allocations on the basis of their values, which may be tempered by representations from, and influence of various interested parties. Government allocation of finance to develop and support professional education is another variable that must be noted.

In Australia membership (or eligibility for membership) of the Institution of Engineers, Australia is a standard of professional achievement. Job advertisements frequently carry the stipulation that applicants should have qualifications and experience that would make them eligible for membership of the I.E.Aust. As a result of an industrial court award, eligibility for I.E.Aust. membership is a basic criterion in salary determination.[44] The I.E.Aust. has two standing committees concerned with entry to the profession - the Board of Examiners and the Qualifications for Membership Committee.

---

44. S.Encel. 1964. Social implications of the Engineers' Case. Journal of Industrial Relations. 6, pp. 61-66.

Control over entry to the profession ensures that there is a difference in J.A. Jackson's words "between the sacred company of those within the walled garden and those outside".[45] Most professionals think of themselves as fit and proper persons to be in that profession and it is possible to draw up a list of desirable qualities that a professional recruit should ideally have e.g., high intelligence, stable personality, commitment to the field, self confidence, etc.[46] Since recruitment training and entrance into practice can be carefully controlled, the potential for social control of professionals is great.

It is argued that as a profession is a community and as it has values, a set identity, and a set status, it is careful about whom it admits. "Although it does not produce the next generation biologically, it does so socially through its control over the selection of professional trainees, and through its training processes it sends these recruits through an adult socialization

---

45. Jackson. op.cit., p.10.

46. McGlothlin. 1964. op.cit., pp.82-3; N.K. Denzin and C.J. Mettlin. 1968. Incomplete professionalization: the case of pharmacy. Social Forces. 46, p.376; Bucher and Strauss. op.cit., pp.325-34.

process".[47] Jencks and Riesman go a step further, and suggest in this sense a profession is akin to a club,[48] and has the problems faced by any club, including who to admit, who to exclude, what it can do for its members, and in what physical surroundings. It could be hypothesised that entry to the engineering profession is controlled in that the educational and socialization process moulds a distinct sort of person who will enter the profession holding the desired values and skills.

Because of the broad acceptance of the entry standards specified by the I.E.Aust., the Institution is in a strong position to communicate its interests regarding length, content and type of course to the educational bodies, and also to Government in its capacity as provider of the financial resources for professional education. The educational interests of the professional body could be seen as a means of reinforcing the exclusive status of the profession. Matters such as course length, content and type have different meanings for the profession and the educational bodies. What organizational basis does the profession have for expressing its interest?

---

47. Goode. 1957. op.cit., p.194.
48. Jencks and Riesman. op.cit., p.202.

PROFESSIONAL ORGANIZATION

Professional organizations play a large number of roles. Robert Merton has suggested that professional associations perform important functions for the individual members of the profession, for the profession as a whole and for the larger community.[49] This thesis is not concerned with what the profession does for the individual but more so with how professional associations serve the profession and the community, particularly with regard to the setting and maintenance of educational and professional standards.

Professions have been likened to communities without a physical locus[50] and as such possess a number of community characteristics e.g., a sense of identity, community values and goals. The professional association then, sets and articulates the aspirations of the community (profession) and its organizational activity is concerned with furthering the community's (professional) interest. Paramount here are questions of status and it has been shown that these are directly related to the educational standards the professional association can insist upon as a minimum requirement of entry.

---

49. Quoted in Kleingartner. op.cit., p.47.
50. Goode. loc.cit.

The Institution of Civil Engineers founded in London in 1818 was the first engineering Institution. It was formed to further engineering education but as chairs of Civil Engineering were established in Glasgow 1840, Edinburgh 1868 and Cambridge 1875, the Institution displayed little or no interest.[51] It was itself a study association, but in 1897 became a qualifying association when it set up its own examinations.[52]

Other branches of engineering followed in a similar organizational vein. In Australia the first such body, the Engineering Association of N.S.W. formed in 1870, began to bring pressure to bear on the Government to set up technical colleges.[53] Ten bodies in 1919 combined to form The Institution of Engineers, Australia, the major body for Australian engineers. (See below, Chapter VII, for description).

The roles of professional institutions summarized by K. Prandy[54] as (a) study function; (b) educational function; (c) qualifying function; (d) professional

---

51. Carr-Saunders and Wilson. _op.cit._, p.158.
52. _ibid_.
53. S. Murray-Smith. 1966. Technical education: the lines of development. In C. Sanders. (Ed.). _Technical Education for Development_. University of Western Australia Press. p.15.
54. Prandy. _op.cit._, p.82.

conduct function; and (e) protective function will be discussed at length in Chapter VII below, in an attempt to understand the importance of the role of the I.E.Aust. in engineering education.

The Institution of Engineers, Australia has laid down its minimum educational requirements for membership and universities and colleges are expected to conform.[55] A professional body insisting on such standards can seriously limit the traditional freedom of the university. Is this a valid role of a professional organization? There is, of course, close co-operation between some academics and I.E.Aust., with many academics sitting on its executive committees, and there have been occasions when Professors of Engineering and Deans of Engineering schools have simultaneously been president of the I.E.Aust.[56] Are there conflicting loyalties?

---

55. See above, footnote 34.
56. 1920, Professor W.H. Warren (Dean - Univ. Sydney); 1935, Professor Sir Henry Barraclough (Dean - Univ. Sydney); 1945, Associate Professor O.F. Blakey (Univ.W.A.); 1950, Professor A. Burn (Univ. Tasmania - Dean of Engineering and later Vice-Chancellor); 1955, R.W. Parsons (Principal - S.A. School of Mines); 1958, Professor D.M. Myers (Dean - Univ.Sydney): 1965, Professor C.E. Moorhouse (Dean - Univ.Melbourne); 1969, Professor J.W. Roderick (Dean - Univ.Sydney); 1973, Professor A.H. Corbett (Univ. N.S.W. - Faculty of Military Studies - Duntroon).

If one compares the objectives of a professional organization with those of a university as does N. Malleson who says "A profession was not merely a vocation, it was also a social group. It had a hierarchy, a social existence ... the quality of a profession was to be exclusive, narrow, and protectionist. The quality of a university was in a sense progressive",[57] it can be argued that similar institutions and practices are being used for conflicting ends. To what extent is this conflict apparent? Engineers writing in the Journal of the I.E.Aust., praise the role the Institution plays in engineering education.[58] The Institution itself plays a role as an accrediting body.

Thus in engineering education in Australia the questions relating to the Institution include:

- to what extent does it pressure the educational authorities - is it more than an accrediting body?
- to what extent are its interests reconcilable with those of the universities?
- how does it perform the role of protecting the status of its members?

---

57. Quoted in R. Nash. 1966. Higher education for the professions. Universities Quarterly. 20, p.155.
58. F.G.A. Sublet. 1936. The Institution and engineering education. Journal I.E.Aust. 8, pp.123-136; A.H. Corbett. 1969. Australian engineering 1788-1969. Journal I.E.Aust. 41 , p.145.

It will be shown below that the organization of the profession is an important resource in the presentation of its interests within the professional engineering educational system. Two examples of organizational power to be discussed briefly now are its control over training and its control over licensure, certification and accreditation.

CONTROL OVER TRAINING

As a profession is a somewhat exclusive group and as it is organized to maintain its pre-eminent position, and as it may attempt to control the supply and flow of recruits, it follows that professions seek to exercise a considerable degree of control over the actual training process. If this is the case there could be conflict between the educational objectives of a profession and the objectives of the universities and other higher educational establishments.

The full role set of the profession has been defined by Jackson in terms of the formal and academic training, and the socialization and initiation into the wider class ideology. Within this framework comes a combination of experience, apprenticeship and the whole range of professional attitudes.[59] In this case a profession would be vitally concerned to exercise some control over the training process, for as Talcott Parsons sees it "a formally organized educational process not only leads to the acquisition of that high degree of skill and knowledge demanded from a professional, but also contributes to the maintenance of the traditions of the occupational group".[60]

A university of course, is not merely a vocational training school. It certainly attempts to educate professionals, as well as non-professionals, and it performs a significant research function. "A profession cannot make its main aim the advancement of knowledge. A university can and must." "Thus", says D. Derham, "the universities and the professions need each other".[61]

The university/professional relationship can lead to conflict. Who should determine curriculum organization and content? Who, in fact, does? Who should determine length of training? Who, in fact, does? Who should determine entry standards? Who, in fact, does?

---

59. Jackson. op.cit., p.7.

60. Talcott Parsons quoted in G. Harries-Jenkins. op.cit., p.69.

61. D. Derham. 1966. The nature of the university and its requirements as affecting education for the professions. In The Role of the University in Preparation for the Professions. University of N.S.W. Symposium. Kensington. N.S.W.

Who should determine numbers of graduates? Who, in fact, does? McGlothlin has suggested that professional schools reach their answers regarding curriculum content and organization on the basis of their aims, their traditions and the requirements of practice.[62] The immediate question that comes to mind is, to what extent are the aims, traditions and requirements of practice also those of the profession itself?

There are conflicts over what should be taught, and over how long a period. Should new theoretical knowledge be included in undergraduate courses though there may be very little immediate practical application? How should the "knowledge explosion" be integrated with basic age-old principles? Why are professional courses the length they are? As it is impossible to teach <u>everything</u> in a short number of years, does lengthening of training reflect status aspirations of professional groups? Does shortening of training reflect desires by the community for more professionals in the field? Are many of our professionals overtrained? Goode suggests that this is the case[63] and that by requiring as much

---

62. McGlothlin. 1960. <u>op</u>.<u>cit</u>., p.34.
63. Goode. 1969. <u>op</u>.<u>cit</u>., p.282; Goode. 1957. <u>op</u>.<u>cit</u>., p.195.

training as they do, professions are attempting, not only to have well trained practitioners, but also to protect and enhance the status of their own group. This, of course, leads to difficulties with sub-professionals as very often professionals will not do the more menial tasks, yet accuse the sub-professional of encroaching if they are to perform many of these tasks.

There may also be conflict over training, between the "old guard" i.e., those who came up the "hard way" and the "newcomers" - those who did the required courses. The newcomers see the "old guard" as a block to successful professionalization; the latter see the former as upstarts.[64] This conflict between old experience and new training can have repercussions on a profession's current attitude to training.

C.E. Moorhouse claims there are four groups that have a vital interest in the training process[65]

(a) the universities which give the courses;

(b) the qualifying body for the profession;

(c) the employers of graduates;

(d) students.

---

64. Wilensky. op.cit., pp.144-5.

65. C.E. Moorhouse. 1966. Undergraduate courses. In The Role of the University in Preparation for the Professions. University of N.S.W. Symposium. Kensington. N.S.W., p.20-32.

The I.E.Aust. plays a significant role in controlling the training of engineers. Professors of engineering have stated that the Institution regulates training of engineers,[66] and that their university accepts limitations imposed by the Institution.[67] Moorhouse states that any degree requirement by a profession, let alone full control over training, can limit the freedom of the university.[68]

The conflict then, in engineering education in Australia is very much one of control. Who controls what? To what extent? Which interests are dominant?

Despite claims to university autonomy, it is in the interest of the established profession to determine its own courses and training programmes. If these are to be done within the university framework the potential for conflict is apparent, for it is also in the interest of the university that it determine its own courses. It has been argued that to a large extent a university (professional) degree is a symbol of status and the

---

66. D. Campbell-Allen. 1969. The Institution of Engineers, Australia. The Engineering Yearbook. Sydney: University of Sydney, p.73. See also Chapter IX below.

67. Barraclough. op.cit., p.309; See also Chapters VII and IX below.

68. Moorhouse. 1960. op.cit., p.179.

profession will strive for a symbol. As this status lessens in importance professions may attempt to lengthen the period of training. Control over training then, may be seen more in status terms than in educational terms. The status/educational balance will certainly affect the outlook of a balance between the professional associations and the educational institutions.

The notion of overtraining warrants further attention, for to the delight of professional associations, but to the consternation of employers, it is asserted that many professionals (especially engineers) are overtrained.

The extent to which the professional body is organized and can use its organization efficiently is an indicator of the control the profession may have over training.

CONTROL OVER LICENSURE, CERTIFICATION, AND ACCREDITATION

It is in the area of licensure, certification and accreditation that the interests of the profession are most distinctly communicated. G.L. Anderson and M.W. Ertell argue that the processes of licensure, certification and accreditation are a "significant part of the moulding forces which form or reform education for the professions".[69]

Licensure

The process of licensure operates ostensibly to protect the public in its dealing with the professions. The process has been traced back to the craft guilds of the Middle Ages. Admission to the guilds was restricted and this restriction gave those insiders a monopoly of the craft, and licensure procedures maintained this monopoly for them.

In the United States and in Australia, licensing is done by state governments, and only some professions are licensed. Licensing appears to be more a governmental function than an educational matter. In an attempt to raise the status of the profession, engineers in Australia in the 1920s tried very hard to obtain government registration. For some time then, licensing appeared highly desirable for engineers. (See below pp.208-213).

Certification

Certification is similar to licensure. There are, however, certain semantic differences in that the use of

---

69. G.L. Anderson and M.W. Ertell. 1962. Extra-institutional forces affecting professional education. In Yearbook of the Society for the Study of Education. Chicago. 61 (Part II), p.236.

"certification" is often limited to the effort to ensure minimum competence rather than stressing ethical standards or regulation of practice.[70] Whether "certification" or "licensure" is used, the reference is to a situation in which the powers of the state are used to regulate admission to a profession. Further, a profession is granted legal protection. Anybody can call himself a carpenter or a clerk, but not a lawyer, or a doctor. Licensing checks this.

Accreditation

W.K. Seldon has described accreditation as "the process whereby an organization or agency recognizes a college or university, or a program of study as having met certain predetermined qualifications or standards".[71] Licensing and certification procedures establish minimum entry qualifications and, in so far as they do this, they force universities and colleges to conform to standardized levels and programmes. If this is so, forces outside the educational institutions play significant roles in determining standards. "By granting

---

70. *ibid.*, p.237.

71. W.K. Selden. 1960. *Accreditation: A Struggle Over Standards in Higher Education.* New York: Harper and Brothers. p.6.

or withholding accreditation, a profession can ideally regulate its schools, as to their number, location, curriculum content and calibre of instruction".[72] Thus, argues Greenwood, a profession controls admission to the profession.

The Institution of Engineers, Australia, gives a list of "accredited" educational institutions and lays down standards for acceptance.[73] It is in the interest of all engineering schools in Australia to receive I.E.Aust. recognition for their courses.

It is in the interest of professional schools generally to have their courses accredited. In the United States there is a complex set of bodies concerned with accrediting both programmes and institutions.[74] The accredited schools can get better staff and better students, all knowing that their activities will be highly regarded by the world outside.

While the accrediting bodies can so strongly affect the internal workings of the universities, it is

---

72. Greenwood. op.cit., p.211.

73. See Appendices C, D, E, F, G and H below.

74. W.K. LeBold, W.E. Howard and J.L. McCarthy. 1965. Accreditation related to engineering and graduate education: a historical review. Journal of Engineering Education. 55, pp. 175-187.

the universities, and not the accrediting bodies that are regarded as legitimating institutions.[75] But in so far as accrediting agencies affect professional education, Anderson and Ertell suggest that they have been a conservative educational force. "In the end, they are disciplinary forces".[76] Goode suggests that professions will completely control examination boards, standards of licensing, accreditation as well as the shaping of relevant legislation, for as the professions have a certain monopoly and autonomy, they will not be judged by others than their peers.[77]

While the major concern here is with professional influence on educational institutions, other influences should be noted, particularly that of "the public", which receives and pays for the service, and Government, which controls many of the educational purse strings. Further, the "qualifying association", the body which determines the standards, runs the courses, sets the examinations, gives professional recognition, and judges the practitioner, must also be noted.[78]

---

75. Jackson. op.cit., p.5.
76. Anderson and Ertell. op.cit., p.249.
77. Goode. 1969. op.cit., p.279.
78. Millerson. op.cit.

Government regulation in the form of licensing and certification can be regarded as another form of professional self-regulation, for the process relies very heavily on professional advice.[79]

Licensing, certification and accreditation then, are effective means of controlling entry to the profession and also subsequent professional behaviour, by giving non-academic bodies (the accrediting agencies) some degree of control over university academic policy. Again the potential professional/university conflict is highlighted.

In addition to this potential conflict, conflict may occur in other spheres. One sphere encompasses the relations between Government and the professional association. In this sphere the potential for conflict over educational provision, is large. Another sphere is that of intra-professional conflict where disagreeing factions might attempt to gain control of the profession's

---

79. A communication from the N.S.W. Department of Labour and Industry shows that the following professions are regulated (i.e. its members are registered) by the Department, but regulating bodies rely very heavily on professional advice: accountants, architects, dentists, medical practitioners, pharmacists, physiotherapists, nurses, surveyors.

bargaining resources. In answering the argument that accreditation and licensing bodies severely limit university autonomy, D.G. Christopherson suggests that if the universities took over the task of certifying engineers, they would presumably set up a committee of academics and industrialists in order to maintain standards - in fact pretty well what is being done now by the professional institutions.[80]

DISCUSSION

The fundamental question that this chapter has tried to provide some background to is "On what basis are decisions regarding professional courses made, and by whom are they made, or at least influenced?" No evidence has yet been presented, but it has been argued that the professional association expresses its interests regarding length, content and type of courses; that the professional association has an organizational structure which allows it to do this; and also that these issues of length, etc. have a bearing on entry to the profession and the controls that are maintained over training, licensure, certification and accreditation. These factors are also important in the process of

80. Quoted in Nash. op.cit., p.198.

professionalization.

There are a number of actors who have an interest in professional engineering education. Some typical statements of interest (which will be examined in much more detail below) express criticism of the professional engineering education system - for example:

[from industry]

> universities and colleges have a tendency to fill students up with a lot of highly theoretical knowledge that is of no immediate use to industry. Universities and colleges must be more realistic in their teaching programmes.

[from the professional body]

> the status of engineers is not as high as it should be, and unless a central body sees to it that courses are properly constructed and standards maintained, status will fall. We must see that status does not fall.

[from some engineering academics]

> universities and colleges are not autonomous, they are being dictated to by the profession and by industry. This is an undesirable state of affairs.

[from some engineering academics]

> our job is to train engineers who will service and provide great benefits for the community. To this end we must co-operate with industry and the profession.

[from some academics]

> engineering is being taught in a totally anti-intellectual way. It is not providing the student with an education, but rather it is making him into a product of capitalist society, concerned mostly with production and profit, and not at all with the social consequences of his activities.

In order then, to achieve the object of producing a professional, as described above, the profession is an organization. It has members, stated goals, shared beliefs, a social and organizational structure concerned with pattern maintenance for members, and goal attainment for the organization as a whole. The educational bodies also, are organizations. Both the profession on the one hand, and the universities and colleges on the other have rules of incorporation, both have formal policy making procedures, both have categories of membership, and both see the other as a significant part of their environment and a factor to be taken into account in much of their policy making. Policies made in these organizations are made with their whole environment in mind.

It is suggested that the making of policy in the profession and in the educational bodies is affected by the values of the participants, by their view of what engineering is, by their professional and status interests, by their view of the future of the profession, and by the roles they play. It is suggested then that what goes into a curriculum is determined by a large number of factors, pure academic considerations being only one of them. They can very broadly be described as the interests of the professional body, interests of the academic bodies, interests of industry, and interests of government.

The policy making process can be examined with the help of organization theory. It could also be examined with the help of systems theory, for a <u>system</u> of engineering education can be isolated and examined. A system has been described as a <u>whole</u>, not merely an <u>aggregate</u> in which objects or elements are in interaction, not merely random contact.[81] System has also been defined as "a set of variables, each of which is interdependent with at least one other variable in the system."[82]

---

81. P. Nettl. 1966. The concept of system in political science. <u>Political Studies</u>. 14, p.307.

82. M.A. Kaplan. 1968. Systems theory and political science. <u>Social Research</u>. 35, p.32. See also O.R. Young. 1968. <u>Systems of Political Science</u>. Englewood Cliffs, New Jersey: Prentice-Hall.

Another methodological approach that might be analytically useful is interest group theory, in which the professional body, industry and Government are seen in this context as interest groups attempting to influence the educational bodies. Before these interests are examined, attention will be focused on the formal policy making process within the educational bodies.

CHAPTER IV

DECISION MAKING IN TWO INSTITUTIONS OF HIGHER EDUCATION

INTRODUCTION

As decisions relating to professional engineering courses are formally made in the universities and colleges, this Chapter describes the formal structure of decision making authority, and shows how the decision making apparatus of an educational body incorporates and encourages outside interests. In describing the formal policy making process in the University of New South Wales and the New South Wales Institute of Technology, this Chapter shows that the formal description of the authoritative bodies and their powers is not an adequate nor accurate description of the factors and processes that determine what goes into the curriculum.

There are two issues here - one concerns communication, the other authority. The communication issue relates to how the interests of the various actors, especially interests concerning length, content and type of courses, are transmitted through the policy making structures and communicated to the decision making authorities. The second issue concerns the identity of these authorities, and the basis upon which they make their decisions.

BACKGROUND

Universities and colleges of advanced education, as institutions designed to advance and communicate knowledge by research and teaching, have been able, within certain limits, to govern themselves. The notion of academic autonomy has been highly valued within universities where members expect to be able to pursue their ends without undue outside influence.

While the image of the university is one of considerable freedom, such as internal self government, appointment of academic staff by other academic staff, freedom of staff to follow their own interests and publish the results of their studies, security of tenure, etc.,[1] the individual staff member is subject to a wide range of constraints. These constraints are often not perceived at all. Some of them relate to the role played by Government as provider of finance, the interests

---

1. D.W. George. 1972. Academic staff structure and university government in Australian universities. Federation of Australian University Staff Associations. August 1972. Mimeograph.

of employers who ultimately employ the graduates, the interests of professional associations, the position in which the individual finds himself in the academic hierarchy, the relations between the academic staff and the administration, the interests of students, the size of the university, faculty or department. Some of these are direct, others indirect; some formal, others informal.

These can probably best be understood by describing the formal and official policy making process in the two tertiary institutions that are considered, the University of New South Wales and the New South Wales Institute of Technology. It will be seen that while there are clearly specified hierarchies through which any decision can be traced, and elaborate procedures for the making of formal policy, there is a great deal of informal power evident at certain levels of the hierarchy - informal decision making power which is not apparent in any formal description. Furthermore, the formal description does not adequately describe <u>real</u> power, for often an authoritative body merely ratifies "decisions" made elsewhere. In addition to internal conditions, conditions outside the educational bodies are also important in internal policy making. These will be examined in Chapters VI, VII and VIII below.

The Acts of Parliament which incorporated the U.N.S.W. and the N.S.W.I.T. gave, in addition to descriptions of their formal hierarchies, indications of the major objectives to be pursued by them. The major inquiries into tertiary education in Australia have seen "community service" as a major objective of higher educational bodies.[2]

Section 7 of the University of N.S.W. Act lists the objects of the University. They shall include:

> a) The provision of facilities for higher specialized instruction and advanced training in the various branches of technology and science in their application to industry and commerce;
>
> b) Aiding, by research and other suitable means, the advancement, development and practical application of service to industry and commerce; and
>
> c) The provision of instruction and the carrying out of research in the disciplines of humane studies and medicine and such other disciplines as the Council may from time to time determine.[3]

---

2. See Chapter II, above, and comments on the Murray and Martin Reports below, in Chapter VI.

3. Calendar of the University of New South Wales. 1972. Kensington. p.A.35.

Sections 24-27 provide that the Treasury shall pay grants to the University and that the University shall keep "proper books of account in relation to the funds of the University".

The N.S.W.I.T. is an organization operating under the aegis of the N.S.W. Advanced Education Board. The A.E.B. is charged with establishing CAEs, and promoting, encouraging, developing, improving, and maintaining advanced education courses.[4] The N.S.W.I.T., states the N.S.W. Higher Education Act, "shall have the responsibility of providing such advanced education courses as are approved by the Minister".[5]

Both the U.N.S.W. and the N.S.W.I.T. have very broad conditions laid down for them in the legislation and both have internal government structures to meet these conditions. Legally they are accountable to Government, and course provision and development will reflect this accountability.

THE UNIVERSITY OF NEW SOUTH WALES - FORMAL DESCRIPTION

[This section will not be footnoted in detail. The major source is the University of N.S.W. Act and By-laws reprinted in the front of the University Calendar]

---

4. N.S.W. Higher Education Act 1969. N.S.W. Statutes. No. 29 of 1969. Section 6.
5. ibid. Section 20.

The Council

The governing body of the University is the Council. The Council consists of

(a) parliamentary members;
(b) official members;
(c) elected members
    (i) elected non-students
    (ii) elected students;
(d) nominated members.

There are two parliamentary members. The official members are the Chancellor, Vice-Chancellor, and Chairman of the Professorial Board. The seventeen elected members represent students (3), graduates (7), academic staff (1) and the "principal faculties" (6). There are twenty-one nominated members.

- 5 from the professions,
- 5 from industry and commerce,
- 3 from employee organizations,
- 2 representing rural interests,
- 6 nominated by the Minister.

Of the forty-three Council members, twenty are "official" or "elected", and twenty-three are "nominated" or "parliamentary".[6] The Council meets at least six times per year and has the following powers:

---

6. Until the Act was amended in 1970, there were eighteen "official" or "elected" and twenty-five "nominated" or "parliamentary" members.

(a) may provide courses ... as it deems fit ... and may confer the several degrees of Bachelor, Master and Doctor.

(b) may ... appoint and terminate the appointment of deans, professors, lecturers and other officers and employees of the university.

(c) shall have the entire control and management of the affairs, concerns and property of the university.

(d) may invest any funds ... .

(e) may act in all matters concerning the university in such manner as appears to be best calculated to promote the objects and interests of the university.

To do this efficiently, the Council has a number of Committees and sub-committees - an Executive Committee, Finance and Personnel sub-committee of the Executive Committee, a Buildings and Equipment Committee, an Academic Committee, a Public Relations Committee, and a Student Affairs Committee. While Council deals with most administrative matters, academic matters are discussed primarily by the Professorial Board and the Faculties.

The Council is vested with broad powers indeed. By its diverse composition it is intended that a broad range of interests be represented. A _prima facie_ case could be made that outside interests are provided with an access channel to the university at this level.[7]

---

7. J. Playford. 1968. Big business and the Australian university. _Arena_. 17, 20-30.

There are access channels at other levels also.

The Professorial Board

The Professorial Board consisting of all the Professors and the Registrar, is "specially charged with the duty of furthering and co-ordinating the work of the Faculties and Departments and encouraging scholarship and research". "The Board shall consider and report upon all matters referred to it by the Council or by the Vice-Chancellor". The Board also "may consider and take action upon reports submitted to it by any Faculty; may refer matters to Faculties for consideration and report" and perform a number of functions related to scholarship. The Board reports to the Council and the Council "may at any time of its own motion or at the request of a Faculty, review any decision of the Board". Like the Council, the Professorial Board has an Executive Committee and a number of other committees.

The Faculties

"The Council may constitute such Faculties as it may deem fit". The Faculties consist of all academic staff, some teaching staff and student representatives "and such other persons having appropriate qualifications as the Council may appoint thereto". Each Faculty shall:

(a) Supervise the teaching in the subjects with which the Faculty is concerned;

(b) Be responsible ... for the conduct of examinations in those subjects;

(c) Take cognizance of and encourage scholarship and research in those subjects;

(d) Consider and report upon all matters referred to it by the Council or by the Vice-Chancellor or by the Professorial Board.

Faculties deal with relevant academic matters and communicate their decisions to the Professorial Board. Each Faculty has an Executive Committee and a Higher Degrees Committee.

The Deans

Deans are appointed by the Council. The Deans shall work under the supervision of the Vice-Chancellor and shall be responsible for the administration of the Faculties.

The Vice-Chancellor

The Vice-Chancellor is the Chief Executive Officer of the University. He is a member of every Board, Faculty and Committee within the University, and is responsible for managing and supervising the administrative, financial and other activities of the University.

The Vice-Chancellor has very little formal power. In the statutes his only formal power is listed as his membership of every Board, Faculty and Committee within the University. In fact, however, the Vice-Chancellor can have as much power within the institution as he desires, for these memberships and his bureaucratic staff allow him to use his vast resources as efficiently as he is able.[8] While it is not possible to explore it fully here, the power of a Vice-Chancellor is the fulcrum around which a great deal of policy making revolves. The legislation certainly understates the power of the Vice-Chancellor as Sir Philip Baxter, former Vice-Chancellor of the University of N.S.W. has shown.[9]

There are also a Chancellor and a Deputy Chancellor, both of whom are members of the Council.

---

8. J.P. Baxter. 1968. The role of the Vice-Chancellor in the University of N.S.W. The Australian University. 6, pp.4-13, is an extremely interesting account of how this former Vice-Chancellor perceived the role of Vice-Chancellor, and how he saw an informal body, the V.C.A.C. as probably the most important body within the University. It is of interest to compare Baxter's paper with those of R.B. Madgwick. 1968. Reflections of a retired Vice-Chancellor. The Australian University. 6, pp. 14-32; and A.G. Mitchell. 1968. The role of the Vice-Chancellor. The Australian University. 6, pp. 33-58.

9. Baxter. op.cit.; See also Baxter. 1968. Problems in the administration of modern universities. The Australian University. 6, pp. 102-121.

A formal characterization of the hierarchy of authority dealing only with the Council, the Professorial Board, the Faculties, the Deans, the Vice-Chancellor, Deputy Chancellor and Chancellor somewhat misstates the real position. It ignores at least three important and relevant structures

(a) the Vice-Chancellor's Advisory Committee
(b) the Schools and Departments
(c) the Visiting Committees.

Furthermore by describing the Council (quite correctly) as the supreme governing body it does not distinguish between innovation and ratification, nor the special spheres of competence the various bodies may have.

The Vice-Chancellor's Advisory Committee

This is an advisory committee that meets weekly. It consists of the Vice-Chancellor, the Pro-Vice-Chancellors, the Chairman of the Professorial Board, and the Deans of the Faculties.

The V.C.A.C. has no formal status whatever. It was formed by the Vice-Chancellor and not by the University Council. Nevertheless it has been described by Baxter as the centre of communication in that members have news filtered up to them from within their Faculty, and the members are also all members of the Professorial Board.[10] While it meets informally, the V.C.A.C. deals with high level administrative matters.

The Schools and Departments

Within each Faculty there are a number of Schools, corresponding to the disciplines within the Faculty. Each School is headed by a Professor. Several Schools are broken down into Departments corresponding to sub-disciplines. For example, the Faculty of Engineering has seven Schools - Schools of Civil Engineering, Electrical Engineering, Highway Engineering, Mechanical and Industrial Engineering, Nuclear Engineering, Surveying, and Traffic Engineering. The School of Civil Engineering has three Departments - Water Engineering, Structural Engineering, and Structural Mechanics. The School of Electrical Engineering has five Departments - Communications, Control Engineering, Electronic Computation, Electric Power Engineering, and Solid State Electronics. The School of Mechanical and Industrial Engineering has four Departments - Applied Mechanics,

---

10. Baxter. 1968. The role of the Vice-Chancellor ... op. cit.

Fluid Mechanics and Thermodynamics, Agricultural Engineering and Industrial Engineering. The other Schools are not divided into Departments.

While all members of the academic staff are members of Faculties (or Boards of Studies), they are also members of Schools (and sometimes Departments). Their role as members of a Faculty is clearly defined in the Act and By-laws (Chapter IV), but nowhere is the role of a member of a School or Department defined, or even given any formal recognition. While the Faculty has a formal status, it is in the School or Department, says Professor D.W. George, that the most important decisions affecting academic staff are made.[11] The Head of a School or Department is in a position to pursue the interest of that School or Department at higher levels - moreso than non-professorial members of the School or Department.

The Departmental Head usually decides the internal governmental arrangements for his Department. He decides whether there will be staff meetings, how frequently they are to be held, what sorts of things will be discussed, how decisions will be arrived at, etc. The extent to which these are formal meetings depends usually on the Head and the relations he has with his colleagues. The

---

11. George. op.cit., p.22.

term "God-professor" came into use to describe the omnipotent Head.[12]

When applied to Schools in the Faculty of Engineering the role of the Head of School is important in deciding a great many aspects of School policy, not only internal matters (including both teaching and administration), but also matters relating the School to outside bodies (such as industrial liason, research programmes, consulting). Because of his position, the Head of School can often commit the School to a certain set of goals or a certain course of action without ever having the matter discussed in any of the formal governmental structures in the university (and sometimes without having them discussed even in the School or Department).

The power of the Head of School to make policy was something that academics referred to frequently in interviews (see below Chapter IX). The Head, together with members of his School make decisions from time to time, which are ratified by Faculty at a later date.

---

12. R.S. Parker. 1965. Departments and God-Professors. Vestes. 8, pp. 17-24.

13. See also, George. op.cit., Chapter 3.

The point that is being made is that while there are elaborate formal structures set up within the university to make policy, decisions often are initiated, and often completely dealt with in an informal non-authoritative body - the School staff meeting - which has no formal status whatever. There is no formal requirement for the Head of School to discuss policy matters even with the members of the School. Policy making within the School is very much a matter of personal style, and the extent to which outside interests are encouraged and successfully presented depends largely on the Head of School. The implications for policy making in engineering education are quite far reaching.

Not only can a Head of School (or an individual staff member) liase with bodies outside the university and incorporate their interests into courses, the university as a whole has made provision for university/industry liason to be placed on a more formal and regular basis.

The Visiting Committees

As a means of showing awareness of the interests of industry and Government, the University of New South Wales has developed a number of panels, known as Visiting

Committees, to ensure satisfactory liason. It is particularly noteworthy that the University considers the interests of industry to be sufficiently important to formalize the relationship. This is an extremely rare action for an Australian university to take. The establishment of these committees is politically important, for the terms of reference (below p. 95) are couched in terms that could lead critics to argue that the University is surrendering some of its autonomy to ensure industrial satisfaction. The committees are also important in studying the policy making process within the University, for here is a formally established channel for the expression of non-academic interests.

The major Schools in the Faculty of Engineering have Visiting Committees (the School of Nuclear Engineering does not have such a committee).[14] As can

---

14. Several Schools outside the Faculty of Engineering have Visiting Committees. The full list at the end of 1972 was: Accountancy, Applied Geology, Applied Physics, Building, Chemical Engineering and Fuel Technology, Chemistry, Graduate School of Business, Health Administration, Highway Engineering, Mechanical and Industrial Engineering, Mining Engineering, Optometry, Surveying, Statistics, Traffic Engineering, Food Technology and Biological Process Engineering, Electrical Engineering, Civil Engineering.

be seen from the resolution below, Council expects the Visiting Committees to play a role in the development of policies - policies that affect the School. The attitude of staff members to the Visiting Committees in engineering is discussed below (Chapter IX).

On July 8, 1968, the Council of the University passed a resolution setting out the terms of reference, membership, and modus operandi of the Visiting Committees. The resolution (No. 68/137) read as follows:

VISITING COMMITTEES

Terms of Reference

1. To appraise the educational programmes of the School in relation to the needs of industry and professional practice.

2. To receive and discuss the Annual Report of the Head of the School.

3. To report to the Council on the special problems facing the School.

4. To aid the development of the School in any way possible.

Membership

Normally up to ten members appointed by the Council on the nomination of the Vice-Chancellor.

Up to three members appointed by the Council on the nomination of the Board of the Alumni Association.

The professors of the School.

The Dean of the relevant Faculty.

A Pro-Vice-Chancellor nominated by the Vice-Chancellor.

The term of office of those members who are not ex officio shall be three years.

The chairman shall be appointed by Council and chosen from those members who are not ex officio.

Modus Operandi

The Visiting Committee shall normally meet once per year, but special meetings can be called if the Head of the School and the Chairman agree they are necessary.

The Registrar's Division will call the meeting on a date agreeable to the Chairman, the Head of School and the Dean. The notice of meeting will be sent out in sufficient time for members to advise of matters they wish placed on the agenda.

The Annual Report of the Head of the School with any other necessary briefing papers will be sent out at least ten days before the meeting.

The Visiting Committee will first meet in the School and will inspect laboratories, meet the staff, and have informal discussions on the matters raised in the Annual Report. The Head of School will arrange this programme.

Later, at a nominated time, the Visiting Committee will meet formally in a suitable room, preferably in the School. A minute secretary will be present for the formal meeting.

The Chairman, taking the Annual Report as read, will invite discussion on it, noting particularly those matters which the Visiting Committee wish to draw to the attention of Council.

The minute secretary will prepare a draft of the proceedings, send it to the Head of School and the Dean for editing, and then send the edited report to the Chairman for signature.

The Chairman's Report will then be sent to the Vice-Chancellor for transmission to Council.

Although the Visiting Committees were set up in 1968, the University had a system of advisory panels before then. The Advisory Panels were set up by the

Council on 13 March 1950 to "secure advice on the structure and syllabuses of University of Technology courses. It was considered that the standing of such courses in the community would be enhanced as a result of critical examination by panels of advisers which have no direct connection with the University".[15] The Visiting Committees replaced these advisory panels in an administrative sense rather than in a functional sense.

At the University of N.S.W. a situation exists where outside interests have access at a number of levels. It must be stressed however, that at no level is this access in the nature of formal power, but rather it is advisory only. At a formal level it has been shown that representatives of industry, the professions, and Government are members of the University Council. The Council has also established Visiting Committees. Outside interests are also quite free to liase with any School, either through the Head or through any individual member. In short there are three levels to which outside interests can be transmitted. In summary they are (1) "the university", (2) the School, and (3) the individual academic.

---

15. New South Wales University of Technology, Council Minutes. March 13, 1950.

If the university were a closed system influence would be presented only at the top level of the hierarchy. However it is seen that it comes at all levels. The implications and ramifications of this will be examined in the next Chapter.

THE NEW SOUTH WALES INSTITUTE OF TECHNOLOGY

The N.S.W.I.T. like the other CAEs was established as an alternative to the universities. It was established to provide more technologists for the community by catering for the large number of students who could not be accommodated in the universities and to provide them with a realistic and practical training unlike the too highly theoretical education offered in the universities. (See Chapter VI below for a discussion of the differences.)

Like the universities the colleges rely almost entirely on funds from the Commonwealth and State Governments in order that they might fulfil their objectives. The N.S.W.I.T. has a governing body, a hierarchy of formal (authoritative) boards and committees to develop its policies and curricula. Like the universities there are also informal (non-authoritative) bodies which might well influence the development of policy.

Authoritative Bodies

The Council is the governing body of the Institute, and according to the Higher Education Act, its members are appointed by the Minister. The members come from three groups - (a) official members; (b) elected members; and (c) nominated members.

The official members are the Director of the Institute and up to two others, designated as official members. The elected members contain no less than one, nor more than three who are elected by the staff, and one member elected by the students. The nominated members "shall be nominated by the Minister and shall include:

(a) persons experienced in educational fields;

(b) persons experienced in industry or commerce;

(c) persons practicing, or who have practiced in the professions; and

(d) persons having such other experience or qualifications as the Minister deems appropriate,

but shall not include servants of the college".

The Act stipulates that the Council shall have between fifteen and twenty-three members. It can be seen that the intention was that the majority would not be staff members, nor representatives of the staff of the

Institute. In 1972 the Council contained twenty-one members, four of whom (including the Director) were staff representatives. The Minister then, has a great deal of latitude in determining the composition of the governing body.

There is an Academic Board which is the "senior advisory body on academic matters in the Institute". Although the Act does not make it clear, it appears that the Academic Board advises the Council. The Board consists of the Director of the Institute, the Deputy Director, the Deans, the Heads of Schools, the Registrar, six members of the academic staff elected by the academics and no more than four staff members nominated by the Director. This Board performs a function similar to that performed by the Professorial Board at the U.N.S.W. in that it is the major academic policy making body.

The Academic Board has established a number of Boards of Studies. These correspond to the disciplines in the Institute, and at present there are Boards of Studies in Architecture and Building, Business Studies, Engineering, Mathematical and Computing Sciences, and Science. Each Board, made up wholly of academic representatives of the disciplines covered, and also of other disciplines in the Institute, has the function of making "recommendations on any matters brought before it by the Chairman, or by any member of that Board, or referred to it by the Director or the Academic Board".

Although the Academic Board and the Boards of Studies have only advisory powers, they are included within the category "authoritative bodies" because they form part of the official hierarchy of government within the Institute.

Non-authoritative Bodies

In turning to the "non-authoritative" bodies there are two major structures. First there are the Faculties, Schools and Departments. The Faculty of Engineering, for instance, has three Schools - Electrical Engineering, Mechanical Engineering, and Civil Engineering. The School of Mechanical Engineering has two Departments - a Department of Mechanical Engineering and a Department of Production Engineering. There is a Dean of the Faculty. Each School has a Head, and there is a Principal Lecturer in each School or (heading each) Department. Below them are numbers of Senior Lecturers and Lecturers. Faculty, School and Department policies are made informally within these structures, and comments made above about the informal nature of power and policy making within Schools at the University of N.S.W. apply equally to the N.S.W.I.T.

The second "non-authoritative" body is the Course Advisory Committee. Page 27 of the 1972 Calendar of the N.S.W.I.T. states:

> The relating of syllabuses and curricula to the needs of the professions in commerce and industry underlies the educational philosophy of the New South Wales Institute of Technology.
>
> To achieve and maintain this objective, the Institute has established Course Advisory Committees, membership of which is drawn from the representative groups of interests in the professions including the professional institutions, educational authorities, government and semi-government departments, industry and commerce.
>
> The deliberations of Course Advisory Committees are devoted principally to a review of syllabuses and curricula, in terms of the training needs of the particular fields. Thus recommendations in connection with new developments, or for revision of existing subject matter, contribute largely to the business of the committees. However, review is also made of enrolment trends and students' progress, equipment and teaching facilities, to ensure that standards are achieved commensurate with modern manpower requirements.
>
> Meetings of Course Advisory Committees are held at least once a semester.

In engineering there are three Advisory Committees, one each in Civil and Structural Engineering, Electrical Engineering, and Mechanical and Production Engineering. The Course Advisory Committees each consist of about twenty members, the only Institute members being the Dean, the Head of School, and the Principal Lecturer. The remainder represent industry, government departments and the Universities of Sydney and New South Wales.

While the committee is purely advisory, evidence will be presented to show that these committees can sometimes have an impact on the content of courses. The government of the N.S.W.I.T. is largely in the hands of people not academically connected with the Institute. While the academics may in fact make much of the policy, their decisions are formally advisory. Furthermore, the whole of the N.S.W.I.T. operates under the aegis of the Advanced Education Board, and this is a further constraint on the academics within the Institute.

The Advanced Education Board

The Advanced Education Board was established by Section 6(1) of the 1969 Higher Education Act (N.S.W.). It exists for the promotion, encouragement, development, improvement, and management of advanced education courses. In doing so, it is expected to report to the Minister with respect to:

(i) the establishment of colleges of advanced education;

(ii) the approval of courses as advanced education courses;

(iii) the fields of studies in which a college of advanced education may offer courses or programmes of studies.

The A.E.B. is expected to make recommendations on matters that are essentially political and economic (establishment of new colleges, and the ensuring of "great effectiveness and economy in expenditure"). The final decisions will be made by the politicians, taking into account questions of educational need, economy, and political expediency. In addition to being a political and economic recommending body, the A.E.B. makes recommendations on educational matters also, such as the establishment of new programmes. It is difficult to separate the political, economic and educational aspects.

When the A.E.B. is charged with making recommendations regarding the fields of studies in which a college may offer courses, the criterion used is one of need. Is there a <u>need</u> for another engineering course? Is there a <u>need</u> for a course in mining engineering - or aeronautical engineering or agricultural engineering, etc.?

While the Board is certainly in a powerful position its power has been exercised in such a way that conflict between the A.E.B. and the N.S.W.I.T. has been minimal. From its inception until 1971, the

Chairman of the A.E.B. was the present Director of the N.S.W.I.T. He resigned the former position shortly before the N.S.W.I.T. became an autonomous institution.[16] The A.E.B. is now headed by an independent chairman.

It would be very difficult then, to describe the academics at the N.S.W.I.T. as "autonomous" (despite the use of the term in the last paragraph). The same could probably be said of the academics at the University of N.S.W. This statement will be discussed and examined in the next and subsequent Chapters.

DISCUSSION

While the statutes invest formal governing power in the Councils, many academic matters in reality are determined by members of the academic staff. At the U.N.S.W. the Council wields considerable power in determining broad scale matters of policy, in determining the general direction of University development and the conditions in which those within the University perform their tasks.

---

16. Report of the New South Wales Advanced Education Board for 1970. 1971. Sydney: Government Printer. para. 6.00, p.31.

An official hierarchial diagram of power within the university would place the Council at the top, below the Council would be the Vice-Chancellor, Professorial Board, and below this the Faculties. Each of these has a number of committees, and it is in the committees, one could argue, where much "real" as compared with "official" power lies.

At Faculty level at the U.N.S.W. the position is one in which the executive committee of a Faculty meets before the Faculty meeting, discusses the issues, perhaps formulates or reformulates them, and then presents them as recommendations to the next Faculty meeting. Here the non-controversial items are accepted in a block at the start of the meeting, and should any member of Faculty require discussion of any item, this follows. Often, though not always, executive committee recommendations become Faculty policy (after ratification), and ultimately are ratified by the Professorial Board and the University Council. The policy, in its final form will be University policy, but there are many items of "university policy" that the upper echelons are quite content to leave to the Faculties. The University Council does not concern itself with matters such as textbook lists, examination arrangements in individual subjects, details of curriculum, teaching method within a discipline, etc. In fact these matters are outside the Council's competence and there are strong conventions against its interference in these matters.

There is no single decision making process at the unofficial and non-authoritative levels, but rather this depends on the Heads of the individual Schools and the relationship they have with their staff, as suggested above. The important feature that is evident here, and throughout this whole work is that <u>formal</u> descriptions of power, influence, and authority are very limited descriptions of the real position. The Councils of the educational bodies consist largely of people whose main activity is not academic.

Academics in the governing hierarchy have a different type of power to that of Council members. Academic power is concerned more with innovation while Council power is concerned more with ratification. The academic's sphere of competence relates to academic policy and details ("micro-policy") while Council's sphere relates to university and college "macro-policy". Both spheres have a profound impact on curriculum determinants in professional education; the macro-policy fits in with general social and political (and hence financial) values. Micro-policy, as made by academics, deals with the interests of the academics and those who have an interest in course details, as they might affect teaching, especially the quality of graduates and research.

While there are formal and informal policy making processes, so too are there direct and indirect pressures brought to bear on the policy makers. These pressures operate at all levels in the academic institutions.

This has implications for the understanding of academic autonomy.

CHAPTER V

MEANS OF ANALYSING THE DECISION MAKING SETTING AND THE INFLUENCES ON DECISION MAKERS

INTRODUCTION

Autonomy can also be discussed in a "macro" and "micro" sense, and in the engineering education system both senses of the notion of autonomy are relevant (this terminology i.e. "macro" and "micro" will not be used here to describe senses of autonomy). Are the influences that are exerted on the educational bodies and on the academics within them, limitations on autonomy?

Many activities within the system are based on a claim to autonomy and on this basis, a host of questions arises. How autonomous are the universities and colleges? How much freedom do the academics within the universities and colleges have? What is the basis for the academics' claim to autonomy? How are non-academic interests communicated? How are they accommodated? Does the communication and accommodation of non-academic interests compromise their freedom or autonomy?

Within the engineering education system claims to autonomy come from the profession, the universities and colleges, the individual academics and increasingly from students. Within any educational system there is no <u>absolute</u> autonomy. The participants interact with each other, and ultimate policy decisions are dependent upon the variety of interests. It is necessary to develop a framework to analyse the communication and accommodation of interests. This is done at the end of this chapter.

In this chapter three practical types of frameworks are considered for use, a systems theory approach, an organization theory approach, and an interest group theory approach. Methodologically the systems and organizational approaches are deemed unsuitable for this present work, and the interest group theory is proceeded with.

Before the framework is drawn up however, an attempt to define the concept of autonomy follows, for the framework will only be meaningful if this important concept is understood.

AUTONOMY

Autonomy, simply defined, is the absence of external constraint.[1] Traditionally, universities have been regarded as autonomous bodies, and the notion of university autonomy has been thoroughly debated in the literature.[2] University academics see their autonomy as one of the major aspects of their profession.[3]

The professions also, are regarded as autonomous bodies. Autonomy for the professional involves "the right to decide how his function is to be performed and to be free from lay restrictions".[4]

---

1. F.E. Katz. 1968. Autonomy and Organization. New York: Random House, p.4.

2. See, for example. R.M. MacIver. 1955. Academic Freedom in our Time. New York: Columbia University Press; R. Hofstadter and W.P. Metzger. 1955. The Development of Academic Freedom in the United States. New York: Columbia University Press; A.H. Halsey and M. Trow. 1971. The British Academics. London. Faber and Faber, Chapter 4. A special issue of Vestes was devoted largely to "University Autonomy" (Volume 12, No. 2, July 1969).

3. Personal observation based on the writer's experience as an executive member of a university staff association. See also E. Gross. 1968. Universities as organizations: a research approach. American Sociological Review. 33, 518-544; and Professorial Board, University of Sydney. 1963. Academic Administrative Structure. The Australian University. 1, 123-134.

4. G. Strauss. 1963. Professionalism and occupational associations. Industrial Relations. 2, p.8.

The authority and freedom to regulate themselves and act within their sphere of competence is something professionals strive to protect. Autonomy, in the professions, means having one's actions judged by colleague peers, not lay outsiders. This autonomy is a derivative trait, says W.J. Goode[5] and based on the mastery of a knowledge area. No occupation can lay claim to autonomy unless it asserts that no related occupation possesses superior or comparable knowledge of its tasks, and superior or comparable skill in performing them.

In order then, to ensure autonomy, a profession must make the university surrender some of its autonomy to the profession. The university, in order to assert its autonomy must not be subject to outside control, particularly from the professions. If however, the profession and the educational bodies both seek to increase or maintain their perceived levels of autonomy, and if both lay claim to absolute autonomy, a conflict situation is inevitable.

---

5. Goode. 1969. op. cit., p. 291.

S. Encel claims that in Australia professional education has been characterized by the strong influence of the professions, but as the universities grow, he maintains, they will become dominant in university/professional relations.[6] There is no evidence, however, to support Encel's contention. He contends further that there will be great strain between the two autonomous bodies.[7]

Is one organization dominant? Professional schools are part of universities. Universities are expected to govern admission, staffing, personnel policies (e.g., conditions of appointment, salary within a pre-determined range, tenure), curriculum, teaching loads, research policies, and the allocated finance.[8] Professional schools will often claim uniqueness in the university environment and try to become an exception to general university policy.[9] McConnell _et al_. have tried to describe a satisfactory

---

6. S. Encel. 1966. The nature of the professions and their requirements. _University of N.S.W. Symposium on the Role of the University in Preparation for the Professions_. Kensington. p.8.
7. _ibid_.
8. Anderson. _op.cit_., p.20.
9. _ibid_.

university/profession relationship, and conclude that while each owes the other something, the university keeps the profession tied to scholarship in the intellectual environment the university provides.[10]

The professions, for reasons mentioned above (Chapter III) feel they must control - or at least be largely involved in - the educational process. If this degree of control is insisted upon, there is the likelihood of conflict between the profession and the university, and this conflict revolves around the nature of autonomy. While both the profession and the universities strive for autonomy, a valid question to ask is whether the constraints of the profession on the university are greater than those of the university on the profession.

In the academic setting autonomy is identified on two distinct levels: (a) the autonomy of the educational institution as a whole which can be assessed in terms of the relationship between the educational body and the significant other institutions

---

10. T.R. McConnell, G.L. Anderson, and P. Hunter. 1962. The university and professional education. Yearbook of the National Society for the Study of Education. Chicago. 61 (Part II), pp. 254-278.

in its environment, and (b) the autonomy of the individual academic. Both levels need to be discussed to understand the factors which influence the curriculum, and to ask tentatively whether academics are, in fact, as autonomous as they often claim to be.

As stated above "autonomy" has been described by F.E. Katz as the absence of external constraints.[11] It is obvious from the material presented so far that the institutions of tertiary education in Australia are not free from external constraint. As an example, the Australian Universities Commission, the Australian Commission on Advanced Education, as well as the N.S.W. Advanced Education Board clearly act as constraints on the educational bodies concerned. The first two of these bodies make recommendations regarding Government finance in tertiary education. The provision of finance, upon which the universities and colleges are dependent, is an important constraint on them.

---

11. Katz, loc. cit.

Government Finance

Universities and colleges in Australia have a triennial income of $1,020,453,000.[12] The major proportion of this comes from Commonwealth and State Governments. The Commonwealth Government provides $1.00 for every $1.85 raised by the State for recurrent grants, and $1.00 per $1.00 for capital grants.

The component to be provided by the State Government includes fees paid by students and in order to attract a maximum recurrent grant from the Commonwealth Government the State must make its contribution. If the State for some reason cannot, or does not wish to contribute the full amount, the Commonwealth grant will be proportionately less. The States can, for example, decide that student fees should make up a greater part of the $1.85 than previously, and thus order a fee

---

12. The sum quoted is for the 1973-5 triennium. The sum was derived from Australian Commission on Advanced Education. 1972. Report for Triennium 1973-1975. Canberra: Commonwealth Government Printing Service, Table 4, p.18, and Table 5, p.19; and Fifth Report of the Australian Universities Commission. 1972. Canberra: Commonwealth Government Printing Service. Table 2.2, p.23.

increase. [The Commonwealth Government has announced that from 1974 it proposes to take over the States' role in tertiary education and to abolish student course fees.]

The Commonwealth Government makes its allocations on the recommendation of the Australian Universities Commission, in the case of universities, and the Australian Commission on Advanced Education in the case of colleges of advanced education. A study of the A.U.C. and the A.C.A.E. reports will give an indication of priorities in this area.

Provision of finance is certainly an important constraint on the activities of educational bodies, but applies on a broad rather than a narrow scale. Without the Government millions the universities and colleges would simply not be able to operate.

As stated, academics have regarded academic freedom as important because, as one commentator put it, academic freedom is an effort to acknowledge the unique relationship between higher education and society.[13] It is argued that academic freedom is

---

13. J.D. Millett. 1962. The Academic Community: An Essay in Organization. New York: McGraw-Hill, p.56.

important so that scholars can pursue the search for truth, the independent research about the world around them, without having to limit themselves to acceptable dogma to ensure that their findings support the socio-political or cultural system. A.K. Stout sees university autonomy as

> the freedom of a university, guided by academic considerations, to control all its academic affairs without direct or indirect interference from non-academic interests, political, religious, business or of any other kind. ... On the teaching side, academic autonomy includes control of the admission of students, the contents of courses of study, the evaluating of students at all stages, the determination and maintenance of standards, the introduction of new subjects and the appointment and tenure of teaching staff. [14]

As has been frequently pointed out, Stout's position is perhaps a utopian one, for in reality the universities exist within a community, and cannot be isolated from it. Total autonomy, that is total absence of external constraint, is simply not realistic.

Realising some of the constraints that exist, politicians and others still talk about academic autonomy. Malcolm Fraser, while Minister for Education

---

14. A.K. Stout. 1969. The basic case for academic self-government. Vestes. 12, p.126-7.

saw the role of the Australian Universities Commission as (among other things)

> to preserve to the maximum extent possible the autonomy of the universities. To the maximum extent possible! Because I think it is futile to suggest that any institution that is dependent upon outside financial support can be entirely autonomous.
> In a country like Australia, the increasing demand of specialization and community pressures require some rationalized approach which imposes a limit on the autonomy of the individual university. In large measure, however, the universities will remain autonomous while they themselves are responsive to the demands of the communities in which they live. 15

To the politician, autonomy and accountability go hand in hand. The universities are autonomous because the Acts that established them say they are! But they still depend almost entirely on Government funds. The CAEs in N.S.W. are not autonomous, nor are they meant to be autonomous - the existence of the Advanced Education Board is evidence of this. It will be shown below that many academics in both institutions feel, however, that they are substantially autonomous.

---

15. M. Fraser, quoted in Z. Cowen. 1969. Autonomy and accountability - a Vice-Chancellor's viewpoint. <u>Vestes</u>. 12, p.123.

Two Australian Vice-Chancellors have written arguing that a degree of autonomy is important, in fact vital, to the continuing existence of the universities, but that as universities are so heavily dependent on Government funds they must be accountable for the spending of these funds, and also for their broad ranging programmes.[16] This notion of accountability adds a new dimension to the arguments about autonomy. A situation exists where universities cannot be divorced from the community and are dependent upon it, yet wish to "preserve" their autonomy. Politicians have repeatedly claimed that their governments would never interfere with the details of a university course. To the politicians then, university autonomy exists, as does a state of dependence, and the requirement, reasonable to them, that universities remain accountable to Government.

Some Vice-Chancellors (and former Vice-Chancellors), for example Professors Cowen, Crawford,

---

16. Sir John Crawford. 1969. The Universities and Government. Canberra: The Royal Institute of Public Administration (Garran Memorial Oration): Cowen, op. cit.

and Baxter[17] have accepted the state of dependence and accountability that exists. Crawford believes that *within* the university, academic freedom means the freedom of the faculty members to teach "according to their lights" and to follow their own lines of enquiry in research.[18] Cowen agrees that there is considerable freedom within the university (money is the only major constraint) but is concerned that the A.U.C. might, by expecting too much detail, turn the universities into detailed reporting agencies. This casts a poor reflection on the confidence in, and the autonomy of universities.[19]

---

17. See for example, J.P. Baxter. 1965. A short history of the University of New South Wales to 1964. *The Australian University*. 3, 74-114; J.P. Baxter. 1968. Problems in the administration of modern universities. *The Australian University*. 6, 102-121.

18. Crawford. *op.cit.*, p.3.

19. Cowen. *op.cit.* The concern that the A.U.C. might interfere with university autonomy has been expressed by the Australian Vice-Chancellor's Committee. See A.V.C.C. *Chairman's Report on the Years 1967-1970*. A.V.C.C. n.p.d. para. 9.4.5, p.65.

Objective and Subjective Freedom

While it is not valid to speak of an absolute value of autonomy, there are a large number of constraints on educational institutions that affect their teaching programmes, research programmes, qualifications issued, financial allocations, development potential, etc. Even with the existence of most of these constraints, most participants in the system feel that they are autonomous. An explanation of this apparent paradox can be found by looking at academic freedom, as did Richard Hofstadter, from two aspects - "objective freedom" and "subjective freedom".[20]

Hofstadter says that one is objectively free when the society in which one interacts and participates will allow one to express critical or novel ideas, or to say and do as one pleases. One is subjectively free when one *feels* free to say and do what one wishes. "Subjective freedom may exist without objective freedom" says Hofstadter, "wherever men are so

---

20. R. Hofstadter. 1955. *Academic Freedom in the Age of the College.* New York: Columbia University Press. (1964 paperback). p.16.

completely confined by the common assumptions of their place, time or class that they are incapable of engendering any novel or critical ideas that they care to express ... such men would be conscious of no restraints, but they would not be free."[21]

The autonomy of an educational institution as a whole can be discussed in terms of "objective freedom". The society within which the educational bodies operate expects the colleges and universities to express critical or novel ideas. Control is exercised financially and culturally. Financial considerations and cultural values usually confine critical and novel ideas to limits bound by a general consensus.

It is Hofstadter's view of subjective freedom that is of interest at the level of the individual academic. How free do academics <u>feel</u> they are? It could be argued that academics have been socialized into an academic/professional environment where there is considerable "subjective" freedom. Their professional socialization puts them into a professional subculture in which freedom of expression is highly

---

21. <u>ibid</u>.

valued, but so too is a sense of professional ethos. As a result, a quite strong, but strictly informal social control system operates. There are certain values implicit in the various institutions - the university, the college, the profession - and while participants are quite free to express opinions, the social control system expects conformity to the value system.

Engineers in common with other professionals have been socialized into an academic/professional environment where there is considerable subjective freedom. The universities and colleges, and the profession encompass general values and standards, and the participants are quite free to express opinions provided they conform to the broad range of implicit values of the immediate environment. For example evidence will be presented below to show that engineering academics often claimed they were autonomous, regardless of the constraints under which they operate. Many are conscious of no restraints, but as Hofstadter says, they are not free either.

The same can be said of universities and colleges, and the position they occupy in the society as a whole. They have considerable freedom provided they operate within socially, politically, and culturally acceptable boundaries.

As interests are presented on at least three levels, so too can autonomy be analysed at these levels. Some interests are presented to the university or college as a whole, others to the engineering faculty, school or department, and others to individual academics.

It is time now to turn from description to analysis. The analysis will focus on the interests of Government, the professional body, and industry, and how these interests are presented to the universities and colleges, and perceived by the academics within them.

The engineering education system exists within a socio-cultural setting and in examining the policy making process, it will be shown that policy results from the accommodation of interests. Interests are communicated through certain formal channels as well as in a number of informal ways. Actors in each of the sub-systems have varying perceptions of the influences that exist. Formal and informal, as well as direct and indirect means of communication can be identified. Decisions are made on the basis of interaction among these actors, but before examining these decisions it is necessary to develop a framework for analysis.

Bearing in mind the comments on autonomy above, methodologically there are a number of ways of proceeding. Three will be discussed.

SYSTEMS THEORY

The universities and colleges can be seen as sub-systems in the engineering education system. In the language of Talcott Parsons this would be a boundary maintaining system in that it tends to maintain itself within certain boundaries relative to the environment.[22] According to Parsons every social system must, as a condition of survival, perform four functions: (1) adaptation, (2) integration, (3) pattern maintenance and tension management, and (4) goal attainment.[23]

22. T. Parsons. 1967. A paradigm for the analysis of social systems and change. In N.J. Demerath and R.A. Peterson (Eds.). System, Change, and Conflict. New York: Pree Press, p.189.

23. T. Parsons and N.J. Smelser. 1956. Economy and Society. London: Routledge and Kegan Paul, Chapter 1.

The universities and colleges would perform a pattern maintenance function. This has been summarized as follows: Each part or role in the system is expected to learn the values of the social organization (or structure, or system), so that it will be perpetuated. This roughly, is the maintenance of the pattern. The process may conveniently be called a socializing or cultural one - in the sense of transmitting cultural values, those beliefs, and emotions that distinguish one pattern, or social organization or social system, from another.[24]

The professional association plays an integrative role. This has been summarized as "the binding together of the roles of the system or (more loosely) of the persons who perform the roles. The binding together requires certain rules or procedures (social norms) including sanctions for enforcement. But these are enveloped in an ethos or <u>ésprit</u> that is commonly called morale, solidarity, cohesiveness or loyalty."[25]

Government performs a goal attainment function, which has been summarized as the pursuance of some

---

24. G. Wootton. 1970. <u>Interest Groups</u>. Englewood Cliffs, N.J.: Prentice-Hall, p.33.

25. <u>ibid</u>.

joint or collective ends, with some degree of success.[26]

Industry performs the adaptation function. This has been summarized as the adaptation of the society, or social system to the social and physical environment. This entails the division of labour, of role specialization for the production of the goods and services that people need.[27]

Parsons has drawn up a meticulous list of patterned interactions within and among sub-systems performing these four functions.[28] These interactions are not random, but are governed by common standards or norms. To follow through these interactions here would involve great length and it may not be particularly valuable. To present a Parsonian systems analysis of the situation involves the likelihood that the development of the model could overshadow the central question of this thesis and still leave the basic issues unexamined.

---

26. ibid.
27. ibid.
28. T. Parsons and E. Shils. 1951. Towards a General Theory of Action. Cambridge: Harvard University Press; Parsons and Smelser. op.cit.; R. Dubin. 1967. Parsons' actor: continuities in social theory. In T. Parsons. Sociological Theory and Modern Society. New York: Free Press, p.527, calculates that there are 1,048,586 distinctive ways for the interactions to take place.

Other system models, such as the simple input-output model of David Easton[29] often confuse the issue by stating in complex diagrammatic form and jargon what can often easily be described in simple prose. The value of a systems approach is that it provides a neat framework for analysis. One strong argument against it, is that in order to accumulate sufficient information to make the model work, one can easily lose sight of the research task at hand, and the exercise can become one of model building and refinement.

ORGANIZATION THEORY

Organization theory provides a more workable attempt to analyse the process under examination, and has been successfully applied to studies of a university, and a profession.[30]

---

29. D. Easton. 1965. A Framework for Political Analysis. Englewood Cliffs, N.J.: Prentice-Hall; D. Easton. 1965. A Systems Analysis of Political Life. New York: John Wiley & Sons.

30. Baldridge. op.cit. (deals with a university). Katz. op.cit. (deals with a profession).

In organization theory there has been considerable discussion regarding the extent to which the goals of an organization can be used to help understand the organization (and policy making processes within). Talcott Parsons identifies the defining characteristics of complex organization as the "primacy of orientation to the attainment of a specific goal".[31]

Etzioni describes an organization's goal as "a desired state of affairs which the organization attempts to realise".[32] Although many attempts at explanation focus on goals, several authors are doubtful that this is particularly useful.[33] In expressing these doubts, David Silverman, for example cites several arguments:

1. Very often the means used to try to attain a written or stated goal assume more importance than the goal.[34] Stated goals give important clues, nevertheless to institutional ideologies.

---

31. T. Parsons. 1970. Suggestions for a sociological approach to the theory of organizations. In A. Etzioni (Ed.). <u>A Sociological Reader on Complex Organizations</u> (2nd ed.). p.33.
32. Etzioni. <u>ibid</u>., p.vii.
33. For example, D. Silverman. 1970. <u>The Theory of Organizations</u>. Heinemann: London.
34. <u>ibid</u>., p.9.

2. In order to overcome the difficulty in 1. it has been suggested that the current goals of the leadership of the organization be established. This, says Silverman, tells us only about the goals of a certain group - and hardly defines the goals of an organization.[35]

3. In some organizations goals are defined in an inappropriate way and the observer must infer what the goals are. There are many problems here, and this leads to different observers inferring different goals, needs, or primary tasks.[36]

4. Details of personal motivation of actors are often confused with organizational goals. This leads to attempts to distinguish formal and informal behaviour.[37]

In a study such as this it would be very difficult to establish clear and unambiguous views of the goals of the major organizations. Attempts to define university and college goals have resulted in long lists being produced[38] - these lists reflecting the inability of those involved to agree on which are the primary, or even important goals.

---

35. *ibid.*, p.10.
36. *ibid.*
37. *ibid.*, p. 11.
38. Gross. *op.cit.*, pp.523-525.

"Government" has so wide a range of goals that to explain them results in an expression of the greatest generality, which is often meaningless e.g. "to provide good government for the community" or "to promote the interests of the people", etc.

The professions have stated goals, e.g. the Charter of the Institution of Engineers, Australia, but the objections raised by Silverman apply here. Only their manifest goals are stated. Latent goals, of course, are never stated.

"Industry" likewise has no single definable goal. Notions such as "profit", "growth", "power", "prestige" would all be relevant in discussing goals. Further, there is no simple discernible structure to achieve these. There is no cohesion, for the various parts of industry have nothing in common with each other.

Throughout, there is the problem not only of outlining and agreeing upon manifest goals, but coming to grips with the latent goals. Studies of organizations have tended to focus on formal decision making processes, but the classic Roethlisberger and Dickson study of over thirty years ago[39] showed that informal behaviour patterns affect policy formation and achievement of goals. Many studies since then have shown the existence of informal groups in complex organizations, and assessed and documented their influence on the policy making process.[40]

INTEREST GROUP THEORY

Interest group theory provides a less sophisticated, yet more amenable framework. The universities and colleges - and the academics within them - can be thought of as targets ("something to be affected by an action or development"[41]) to which actors direct interests. The reason that actors interact with the targets is that the target body is in a position to make decisions in which the actors have an interest.

Interest group theory in political science usually focuses on the nation state, with the

---

39. F.J. Roethlisberger and W.J. Dickson. 1939. Management and the Worker. Cambridge: Harvard University Press.
40. J.A.C. Brown. 1954. The Social Psychology of Industry. Harmondsworth: Penguin; J.A. Litterner (Ed.). 1969. Organizations: Structure and Behaviour. (2nd ed.). New York: John Wiley & Sons. Volume 1, part 3.
41. Wootton .op. cit., p.15.

legislative and executive branches of Government as targets, and concerns itself with the mass of private associations which reflect the whole gamut of social, cultural, economic and political interests, and which attempt to have Government take note of their special concern. A legislative/executive analogy following the Westminster pattern can be drawn in the present study. It is drawn because in interest group theory it has been shown that interests are presented differently to legislative and executive bodies.[42] In this study it will be seen that they are presented differently to "the university" (or "the college") and to "the staff".

The university or college Council is the legislature. It makes decisions that are binding on those who choose to be within its jurisdiction. Its decisions also affect the professional association, industry, and Government.

The academic staff can be thought of as an executive branch of Government. They contain the greatest expertise found within the legislative/

---

42. For example, see <u>ibid</u>., pp. 86-91.

executive system. They cannot make laws, as can the legislature. They can, however, make regulations. The legislature meets regularly, but infrequently while the executive goes about its policy making and administrative functions continuously. Major changes and innovations must be ratified by the legislature - and ratification is usually forthcoming. The legislature however, has ultimate control although it seldom has to use its sanction over the executive, for the executive operates within generally accepted limits. Although formal power, in Government, is vested in the legislature, political scientists still argue over the nature of power and whether power "really" lies in Parliament, in the Cabinet, or even with the Prime Minister.[43] Within the educational bodies a similar situation exists. Formal power is vested in a "legislature", though considerable power - perhaps a different sort of power - can be found to exist elsewhere.

---

43. See, for example, A. King. (Ed.). 1969. The British Prime Minister. London: Macmillan: H.V. Wiseman. (Ed.). 1966. Parliament and the Executive. London: Routledge and Kegan Paul; W. Bagehot. 1963. The English Constitution. London: Collins. The Fontana Library (especially introduction by R.H.S. Crossman); L.F. Crisp. 1970. Australian National Government. Croydon, Victoria: Longmans, parts 3 and 4.

The interest groups perform an interest articulation function (defined by G.A. Almond and G.B. Powell as the process by which groups make demands upon the decision makers[44]) in that they translate their values into effective influence in order to obtain favourable action. To understand the articulation process, Almond and Powell examine the kinds of structures that perform the articulation function; the variety of channels through which demands are articulated; and the styles of interest articulation.[45]

Almond and Powell locate four kinds of structures - what they call

a) anomic interest groups.

b) non-associational interest groups;

c) institutional interest groups; and

d) associational interest groups.[46]

Of these, the latter two are of relevance here. The institutional interest groups, they say, are formal organizations composed of professionally employed personnel with designated political or social functions other than interest articulation.[47] Government would

---

44. G.A. Almond and G.B. Powell. 1966. Comparative Politics. Boston and Toronto: Little Brown & Co. p.73.
45. ibid., Chapter 4.
46. ibid., pp.75-79.
47. ibid., p.77.

fit in here. Associational interest groups are groups whose particular characteristics are explicit representation of the interests of a particular group, a full time professional staff, and orderly procedures for the formulation of interests and demands.[48] In this case the professional association could be described as an associational interest group. A case could be made to have "industry" categorized here as fitting within one or other of these two structures.

The channels and means of access that Almond and Powell discuss are a) physical demonstrations and violence; b) personal connection; c) elite representation; and d) formal and institutional channels.[49] Of interest here is b) personal connection, which is often typified by family, school, professional or social ties. An "old school tie" network is a classic example. Also of interest is d) the formal and institutional channels of access, which exist in any system.

Styles of interest articulation, say Almond and Powell may be a) manifest or latent; b) specific

---

48. ibid., p.78.
49. ibid., pp. 80-86.

or diffuse; c) general or particular; and d) instrumental or affective.[50] Of interest here is the manifest-latent style. "A manifest interest articulation is an explicit formulation of a claim or demand; a latent articulation takes the form of behavioural or mood cues which may be read and transmitted into the ... system".[51] Also of interest is the specific-diffuse style. Diffuse statements may indicate dissatisfaction, and seldom provide accurate cues for decision making policy (e.g. "The status of engineers should be raised or maintained"). Specific statements are much more straightforward and provide cues for decision making (e.g. "universities and colleges should have their allocations increased by $100 million so that courses can be lengthened".)

"Targets are not", says Graham Wootton, "impassive entities waiting to be manipulated - they are made up of persons or roles, with distinctive configurations of norms and perceptions".[52] In this case the norms and perceptions that are important to the

---

50. ibid., p.86.
51. ibid.
52. Wootton. op.cit., p.86.

targets relate to the concept "autonomy." The belief in the necessity for and the existence of academic autonomy regulates patterned behaviour.

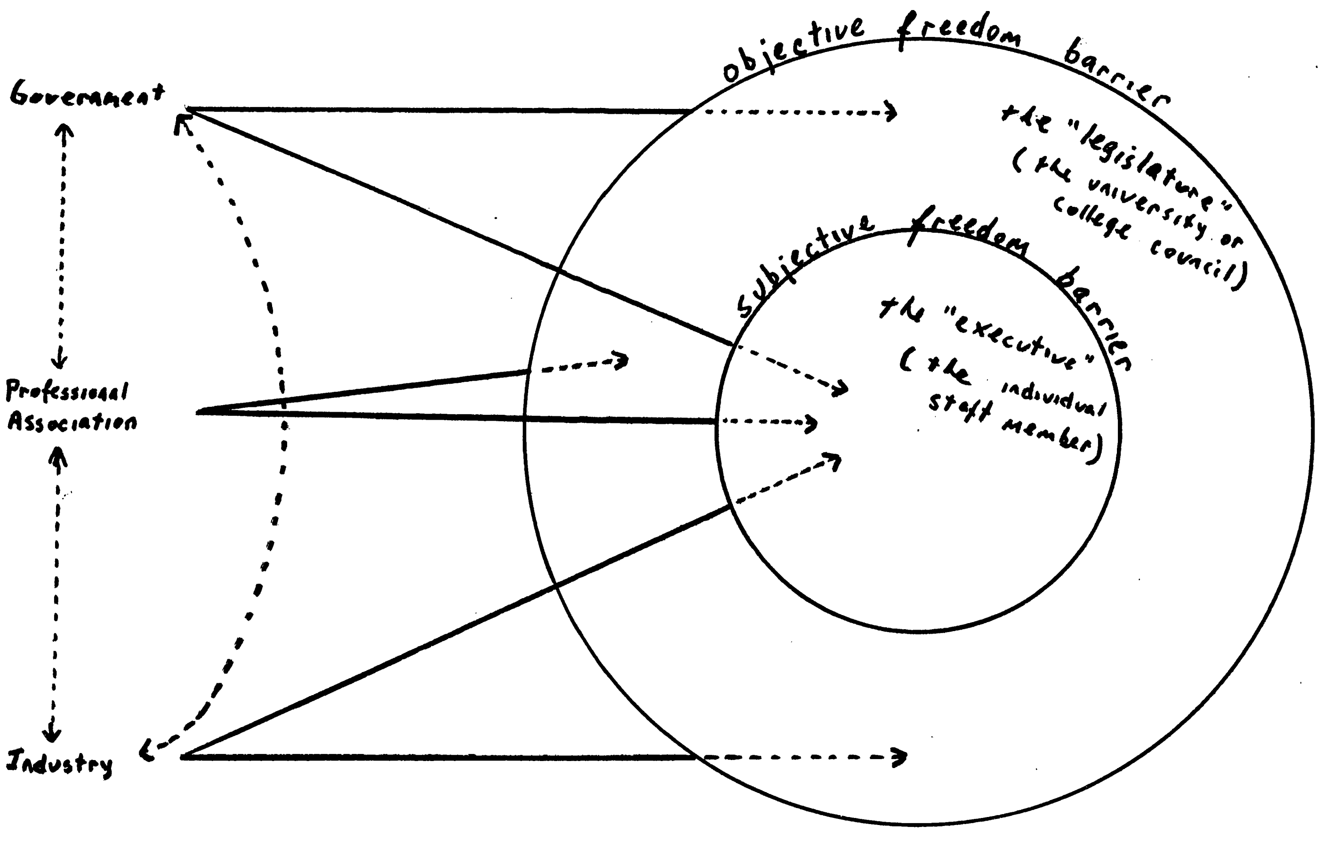
The actors and the targets all grant that autonomy is essential for the proper functioning of the educational system, but at the same time the decisions made by the targets affect the interests of the actors and, autonomy or no autonomy, these interests must be guarded. Hofstadter's view of objective and subjective freedom is relevant here, for it helps highlight the difference in perceived role and actual role of all the bodies concerned.

The framework then, must take account of the actors, including the target. It must determine how the actors influence the target ("get [it] to do something [it] would otherwise not do".[53]) It must

---

53. R.A. Dahl. 1963. Modern Political Analysis. Englewood Cliffs, N.J.: Prentice-Hall. p.40. A question of interest and of some relevance is - how many targets can these actors influence - do they influence each other? While they undoubtedly do, it will not be possible, in this work, to examine the extent to which they do this.

account for the structures, channels and styles of interest articulation and account for the extent to which interests may penetrate the autonomy barrier. Diagramatically it can be represented as follows:



Which interests penetrate which barriers? How? What are the structures, channels and styles of interest articulation which allow for this penetration? Can one distinguish formal and informal, direct and indirect styles of presentation of interests? These questions will be answered in Chapter X after the interests, actions and perceptions of the actors and targets have been examined.

CHAPTER VI

INTERESTS AND ACTIONS OF GOVERNMENT

INTRODUCTION

It has been shown above that professional engineers in Australia are trained either in universities or colleges of advanced education. Both universities and colleges receive the bulk of their financial support from Government. Why are there these two structures? What differences are there between them? What is expected of each? How does each handle engineering education? What has guided Government in its policy? What interests does Government have in professional education in general, and engineering education in particular? What role has Government played in the past and what role does it play now?

Australian university education, it is argued, is strongly utilitarian. The utilitarianism was reflected in both the Murray and Martin Reports. The Commonwealth Government has come to exert strong financial control and thereby strongly influence universities regarding future developments.

BACKGROUND

In Australia, Government has a profound interest and a profound influence on all educational provisions and policy making. The nature of Australian federalism has resulted in a situation where the State Governments have had primary responsibility for the educational systems, but in the last fifteen years, the Commonwealth Government has played an increasingly larger role in education, and certainly a dominant role in tertiary education. The Commonwealth and State Governments provide the bulk of the resources for tertiary education. Each, however plays a different role.

Until 1957 Commonwealth Government interest and activity in the sphere of tertiary education was slight. The Commonwealth Government in 1930 established the Canberra University College to provide part-time studies for public servants.[1] The Government also made a small number of grants to universities for specific purposes.[2] In 1943 a Financial Assistance Scheme was established to assist university students,

---

1. Commonwealth Department of Education and Science (J.G. Gorton). 1966. The Commonwealth Department of Education. Sydney: Halstead Press. p.3.

2. ibid.

and at the end of World War II a Commonwealth Reconstruction Training Scheme was introduced to assist ex-service personnel to take university and vocational courses.[3] The Financial Assistance Scheme in 1951 emerged as the Commonwealth Scholarship Scheme, and in that year regular financial grants were made to the states to assist universities.[4] The total amount provided by the Commonwealth Government in the first year was $1,000,000.[5] By 1971/1972 the contribution of the Commonwealth Government to the states for tertiary education amounted to $146,337,000.[6]

The turning point came in 1957 when the Commonwealth Government appointed a committee to make a major study of universities and university education in Australia, and to inquire into, among other things:

1. The role of the university in the Australian community;

---

3. ibid., p.4.
4. ibid.
5. ibid., p.15.
6. Department of Education and Science. 1972. Commonwealth Expenditure on Education in the States. Department of Education and Science Bulletin. May 1972. p.1.

2. The extension and co-ordination of university facilities;

3. Technological education at university level; and

4. Financial needs of universities.[7]

The report of the committee, which came to be known as the Murray Committee, made a number of pronouncements on the role of the universities in the community (Chapter 1 of that report), and then proceeded to describe what it saw as gross inadequacies in the financial position of the universities - especially in regard to accommodation, maintenance and equipment, staffing and salaries. It also pointed to inadequacies in undergraduate education, honours, postgraduate and research work, and the special problems of scientific and technological education (Chapters 3, 4 and 5). It called for the setting up of an Australian University Grants Committee (Chapter 8) and made detailed recommendations regarding immediate emergency grants to be given to universities (Chapter 9).

---

7. Report of the Committee on Australian Universities. 1958. Canberra Government Printer. p.5. [K. Murray Chairman - hereafter referred to as the Murray Report].

The Commonwealth responded by passing legislation to give effect to the Committee's recommendations - the States Grants (Universities) Act, 1958[8] and by establishing, in 1959, the Australian Universities Commission.[9] The then Prime Minister, Mr. Robert Menzies, outlined in some detail the action the Government was to take,[10] and it can be said that the activities of this period ushered in a new era in Government/University relations.

The recommendations of the Murray Committee were welcomed[11] because a much needed stimulus was

---

8. Commonwealth of Australia Acts. Act No. 27 of 1958.

9. Commonwealth of Australia Acts. Act No. 30 of 1959 and amended by Act No. 28 of 1962, Act No. 63 of 1965, Act No. 35 of 1967 and Act No. 117 of 1971.

10. Commonwealth Parliamentary Debates (House of Representatives). 1957. Volume 17, pp. 2695-2702. It is of interest to note that of the ten members who spoke in this debate, 9 had had some university experience - but not one in a technological field.

11. (Anon.) The Murray Report on Australian Universities. Current Affairs Bulletin. 1958. 21 (11), pp. 163-176. Commonwealth Parliamentary Debates (H. of R.). loc.cit. H. Philp. 1970. The piper and the tune - from Murray to the fourth A.U.C. Report. The Australian University. 8, pp. 3-33.

being given to the universities. Certain of the values expressed in the Report have been criticized, especially the strong emphasis on vocationalism and community service.[12] In a review of the first fifteen post-Murray years, Colin Hughes claimed that the Murray Report saw no inherent conflict between the universities and the established institutions.[13] The Report expected the universities to provide for the needs of industry and commerce and to provide society with certain services in exchange for financial support and a high degree of autonomy.[14]

This raises a number of questions about the proper role of universities (see above, Chapter II), but the point Hughes makes is that there is no consensus, especially among university staff, as to the proper role of the university. There has been a

---

12. W.F. Connell. op.cit. H. Philp, R.L. Debus, V. Viedemanis and W.F. Connell. op.cit., pp. 15.-16. See also some of the writings of Partridge and Encel referred to above in Chapter II, esp. notes 19-29.

13. C.A. Hughes. 1972. The Murray Report, Fifteen Years After. Federation of Australian University Staff Associations (mimeograph).

14. ibid., p.6.

questioning, by academics, of Government expectations that the universities should service industry and the community. The Murray Report made it clear that the provision of sufficient graduates, and of "community service" are fundamental roles of the university.[15]

When dealing with technological education[16] the Report discussed its various levels (graduate, diplomate, technician and tradesman) and argued that it was in the national interest that greater provision be made for technological education.[17] Government clearly accepted this view, for the Australian Universities Commission has, since its inception, been dominated (numerically) by scientists and technologists.[18]

The Australian Universities Commission at present consists of a full-time chairman, a full-time deputy chairman, and eight part-time commissioners. The Australian Universities Commission Act[19] states

---

15. Murray Report. op.cit., Chapter 1.
16. ibid., Chapter 5.
17. ibid.
18. For example, of the nine members who prepared the Fifth A.U.C. Report, four are engineers.
19. Commonwealth of Australia Acts. Act No. 30 of 1959 and amendments.

that the members of the Commission shall be appointed by the Governor-General (Sec. 5) and that the functions of the Commission are "to furnish information and advice to the Minister in connexion with the grant by the Commonwealth of financial assistance to the universities established by the Commonwealth and of financial assistance to the States in relation to universities, including information and advice relevant to

(a) the necessity for financial assistance and the conditions upon which any financial assistance should be granted; and

(b) the amount and allocation of financial assistance". (Sec. 13)

"The Commission shall perform its function with a view to promoting the balanced development of universities so that their resources can be used to the greatest possible advantage of Australia". (Sec. 14) In accordance with the Act, the Commission has, from time to time, furnished reports.[20]

The Commission then, is an advisory body, and its recommendations on financial allocations and proposed developments have, by and large, been accepted.[21] Different interpretations of the role of the A.U.C. could be debated at great length. Is it an independent commission or is it dominated by Government? Is it a body which controls the universities? If so, does it do this according to its own criteria or Government's criteria? Is it a buffer between the universities and Government? Or

---

20. Report of the Australian Universities Commission on Australian Universities 1958-1963. 1960. Canberra: Government Printer; Second Report of the Australian Universities Commission on Australian Universities 1961-1966. 1963. Canberra: Government Printer; Third Report of the Australian Universities Commission: Australian Universities 1964-1969. 1966. Canberra: Government Printer. Fourth Report of the Australian Universities Commission. 1969. Canberra: Government Printing Office. Fifth Report of the Australian Universities Commission. 1972. Canberra: Government Printing Office.

21. One notable proposal which was rejected was the Commission's suggestion that Australia's fourth Veterinary Science School should be located at the University of New England, yet following representations and negotiations from and with the Australian Veterinary Association, the Government decided to locate it in Western Australia. See Fourth A.U.C. Report, op.cit., pp. 99-106 and Fifth A.U.C. Report, op.cit., pp. 6-7.

does it filter the demands of the universities through to Government? Is it an efficient regulator of the whole university system? Answers to these questions cannot be found in the legislation, but would come from detailed observation and analysis of the A.U.C. over a period of time.

It can be seen that by providing a proportion of the resources for universities, the Commonwealth Government has the structural and authoritative mechanisms for making allocations, and thereby influencing universities regarding their future developments. There are limitations on the objective freedom of universities, for developments that do not accord with Government thinking are not only not accepted by Government, but perhaps not even presented by the universities to the A.U.C. for consideration. Thus the attitudes and interests of Government, particularly the Commonwealth Government, can have a profound effect on engineering (and other) education.

THE MARTIN REPORT

On August 27, 1961 the Prime Minister announced the formation of a committee to inquire into the future of tertiary education in Australia. The Committee was to be a committee of the Australian Universities Commission, and was established by the Government "to consider the pattern of tertiary education in relation to the needs and resources of Australia and to make recommendations to the Commission on the future development of tertiary education." The Committee, which became known as the Martin Committee presented a three volume report in 1964/1965.[22] The report which has had a profound impact on Australian tertiary education has been subject to critical scrutiny in the literature. It is not in order here,

---

22. Tertiary Education in Australia. Report of the Committee on the Future of Tertiary Education in Australia to the Australian Universities Commission. 1964 and 1965. Canberra: Government Printer, 3 volumes. [Chairman Sir Leslie Martin. Hereafter referred to as the Martin Report.] See Martin Report, vol. 1, p. 225 for the text of the Prime Minister's statement.

to present a critical analysis of the report.[23]

Of all the proposals in the report the one that has been regarded as most significant is that which led to the establishment of a binary system of tertiary education.

> Australian universities have grown up according to a uniform and traditional pattern, and it is unrealistic to imagine that they alone can provide the variety of education needed by young people with a varying range of abilities and a broad array of educational objectives. The Committee believes that much of the pressure on young people by parents, relatives, friends and teachers in urging them to undertake university courses, together with their own desire to do so, is due to the lack of other tertiary institutions of comparable status in the eyes of the community. The known needs

---

23. See, for example: S. Encel. 1965. The Martin Report: tertiary colleges. Vestes. 8(2), pp. 81-85; S. Encel. 1965. The muffled report. Nation. April 3, 1965, pp. 6-8; Harman and Selby-Smith. (Eds.). op.cit.; G. Howie. 1965. The Martin Report: teacher education. Vestes. 8(2), pp.103-107; S. Murray-Smith. 1965. The Martin Report: technical colleges. Vestes. 8(2), pp. 85-89; P.H. Partridge. 1965. The Martin Report. Vestes. 8(2), pp. 71-81; P.H. Partridge. 1968. Society, School and Progress in Australia. London: Pergamon Press; Philp. op.cit.; C. Sanders. 1966. A comparative review of three reports: Robbins, Martin and Hale. The Australian University. 4, pp. 66-94; H.S. Williams. 1966. The Martin Report and After. Australian Journal of Higher Education. 2(3), pp. 252-260. See also Commonwealth Parliamentary Debates (H. of R.). 1965. Volume 45, pp. 933-976, 1047-1060, 1062-1086; and (Senate) 1965. Volume 28, pp. 67-74, 492-518, 535-545, 560-570, 692-791. See also items cited in footnote 36 below.

> of the community for young people trained in a wide range of occupations have led the Committee to recommend the expansion, improvement, and establishment of appropriate institutions to provide a wider diversity of tertiary education. 24

The Committee recommended that three systems be built up - a university system, and Institute of Colleges system, and a teacher training system. The Government rejected proposals that it should enter the teacher training system, stating that this was a State responsibility, not a Commonwealth responsibility.[25]

One of the substantial criticisms of the Martin Report was that while surveying tertiary education generally, there was a disproportionate emphasis on professional education. The report was seen by S. Encel as "largely based on a vocational and utilitarian conception of education and its role in society. The Committee evidently finds it easier to talk about education as an investment, or as a response to the needs of a technological age which demands more people trained in science, technology and management, than as something to be valued for its own sake".[26]

---

24. Martin Report. op.cit., para. 2.61, pp. 36-7.
25. Commonwealth Parliamentary Debates (Senate). 1965. Vol. 28, p.72.
26. S. Encel. 1965. The Martin Report: tertiary colleges. op.cit.

The Federation of Australian University Staff Associations protested, when the Committee was set up, that no academic teacher of the humanities, and only one social scientist were included among its personnel. On the other hand, Encel points out that large employers of technical and scientific graduates were strongly represented, and this, he suggests, may be related to the vocational emphasis of the report.[27] Both Encel[28] and Partridge[29] criticize the report for its vagueness. The reason for this vagueness is difficult to explain in so thorough a report. It might indicate that the Committee unofficially saw its brief as the recommendation of the restructuring of tertiary education in Australia.

This restructuring has taken place. It has led to the establishment of a number of new educational institutions and also to the establishment of a number of advisory and bureaucratic organizations concerned with the administration of the new tertiary system. Nevertheless, an examination of the situation

---

27. _ibid._, p.82.
28. _ibid._
29. P.H. Partridge. 1965. The Martin Report. _op.cit._, p.72.

will reveal a great deal of confusion regarding the roles of the various actors in the tertiary education system, and uncertainty as to the relationship among the various institutions concerned.

When discussing technological education, both the Murray and Martin Reports stressed that it was necessary that there be several levels of training. The Murray Report discussed the relative advantages of several levels of engineering education and concluded that graduates and diplomates have different roles to play,[30] and concluded, in short, that diplomates are generally of far greater use to industry than highly trained graduates.[31] No action came from this suggestion, and if anything, it was ignored, for shortly after the Murray Committee reported, the only Australian university offering a diploma in engineering, The New South Wales University of Technology, changed its name to the University of New South Wales, phased out its diplomas in engineering and left students in the State of N.S.W. with only one means of achieving a professional engineering qualification - by reading

---

30. Murray Report. op.cit., paras. 258-259, pp. 71-72.

31. ibid.

for a university degree.*

The Martin Report very clearly stated its view that education is an investment and is necessary for the (highly desirable) object of economic development. e.g.

> A modern economy needs highly trained people in order to function smoothly and to cope with further growth. Consequently a dynamic economy must be prepared to devote a relatively high proportion of its resources to tertiary education, and also to research and development programmes which facilitate the application of new knowledge to industrial and commercial enterprises. 32

The strong implication in the Martin Report was that a system of colleges would fulfil an important economic and industrial function and would also be educationally worthwhile. The main problem was that the community held university degrees in high esteem, but had little regard for the status of a college qualification. The Martin Committee said that of the 57,000 students in technical courses in 1962, very few could be regarded as "tertiary students".[33] By

---

* The Institution of Engineers, Australia, at that time still conducted examinations which gave a professional qualification, though the number of students attempting the examinations was very small.

32. Martin Report. <u>op.cit.</u>, para. 1.35, p.10.
33. <u>ibid.</u>, para 2.13., p.19.

the late 1960s many of the colleges of advanced education were becoming well established and non-tertiary students were being excluded.

Examination of Table I (p. 160) will show that enrolments in colleges of advanced education are increasing at a faster rate than enrolments in universities, and that the number of students in colleges of advanced education, as a percentage of the number of students in universities is rising rapidly (see column 3). This, and an increase in funds, represents a conscious policy of building up the colleges of advanced education and making them a highly significant part of the tertiary education system.

Projections of engineering enrolments in the CAEs made in 1966 showed a massive anticipated rise - a doubling from 1965 to 1969 (from 8779 to 17667).[34] Enrolments have not, in fact, grown at that rate, but by 1971 there were almost as many students enrolled

---

34. Commonwealth Advisory Committee on Advanced Education First Report. 1966. Canberra: Government Printer. Appendix J., pp. 106-108. [Hereafter referred to as First C.A.C.A.E. Report]

TABLE I

	1 University under-graduate enrolment	2 C.A.E. enrolment	3 2 as a percentage of 1
1970	104,087	38,140	35.65
1971	110,222	45,113	40.92
1972	114,905	53,516	46.57
1973 (est.)	120,335	63,400	52.71
1974 (est.)	126,150	72,400	57.41
1975 (est.)	132,190	81,000	61.32

Source: Adapted from Tables 1D, 5D and 6D (pp. 131 and 146) Third Report on Advanced Education. Canberra. 1972.

in engineering courses at CAEs as there were enrolled in engineering courses at universities (10,322 and 10,496 respectively).[35]

That there is an increasingly strong commitment towards CAEs by the Commonwealth Government can be seen by examining Table 2 (p. 161). Funds

35. Fifth A.U.C. Report. op.cit., Table 4.11, p.50 and Australian Commission on Advanced Education Report for Triennium 1973-1975. 1972. Canberra: Government Printer. Table 2D, p.132. [Hereafter referred to as A.C.A.E. Report 1972].

TABLE 2

Commonwealth Payments specifically for education - 1966/7 to 1971/72

Six States

$'000

	1	2	3	4	5	6	7	8	9
	Universities Recurrent grants	C.A.E. Recurrent grants	2 as a percentage of 1	Universities capital grants	C.A.E.s capital grants	5 as a percentage of 4	Total University grants	Total C.A.E. grants	8 as a percentage of 7
19/66/67	34,262	2,472	7.16	16,354	3,681	22.51	50616	6153	12.15
1967/68	39,192	5,273	13.24	16,329	6,647	40.74	56,241	11920	21,19
1968/69	43,534	6,282	14.43	19,097	8,080	42,33	62631	14362	22.93
1969/70	50,436	10,658	21.26	17,233	9,486	55.04	67669	20144	29.77
1970/71	58,877	15,743	26.74	16,347	14,837	90.82	75224	30580	40.65
1971/72	67,863	19,182	28.26	22,167	18,574	84.18	90030	37756	41.94

Source: Adapted from Department of Education and Science Commonwealth Expenditure in the States. Department of Education and Science Bulletin Canberra May 1972 page 1.

allocated to CAEs are increasing at a more rapid rate than funds allocated to universities and, as the percentages in columns 3, 6 and 9 shows, CAEs are being given an increasingly larger share of Commonwealth allocations.

Table 2 shows an increasing commitment by the Commonwealth Government to the colleges of advanced education. This is probably related to the philosophy underlying the establishment of the CAEs. The CAEs were created so that the needs of industry could be satisfied and that Government, as provider of finance could direct, as it saw fit, one sector at least, of tertiary education. It could do this without infringing any tradition of autonomy - for the new system would not have had such a tradition. To explain the points raised here it is necessary to ask what are the differences between the universities and CAEs.

DIFFERENCES BETWEEN UNIVERSITIES AND COLLEGES OF ADVANCED EDUCATION

Functional Differences

Since the inception of the colleges of advanced education their function and role has been a topic of almost continual examination and debate in the literature.[36] It is not proposed to go into great detail regarding their role, nor to examine the arguments referred to in footnote 36. There has been debate over whether they are "superior/inferior", "separate, but equal", "the same, but different in emphasis" etc. The debate has been concerned with political values and motives as well as with educational values.

---

36. Some discussion of the colleges of advanced education can be found in: S. Encel. 1965. The Martin Report: tertiary colleges. op.cit.; Malcolm Fraser. 1969. External study facilities and the relationship of advanced colleges to the universities. Canberra. Department of Education and Science (mimeograph. March 28, 1969); D.J. Golding et al. (Eds.). 1970. Challenges facing Advanced Education. Melbourne: The Hawthorn Press; G.S. Harman and C. Selby-Smith (Eds.). 1972. Australian Higher Education. Sydney: Angus and Robertson; G.D. Hermann. 1971. Advanced Education: a critique of the two Wark Reports. Australian Journal of Higher Education. 4, pp. 126-136; A.E.B. Phillips. 1970. Colleges of advanced education: in search of an identity. The Australian University. 8, pp. 126-151; S.S. Richardson. 1972. A role and purpose for colleges of advanced education. In Harman and Selby-Smith (Eds.). op.cit., pp. 1-14; L.N. Short. 1967. Changes in higher education in Australia. The Australian University. 5, pp. 1-41; J.F.D. Wood. 1969. Institutes and colleges of advanced education. Australian Journal of Education. 13, pp. 257-269. See also the three reports on advanced education in Australia. op.cit. Vestes. 1970, 13(2) is a special issue devoted to advanced education. See also Commonwealth Parliamentary Debates (H. of R.). 1965. Volume 45, pp. 933-976, 1047-1060, 1062-1086.

In the Parliamentary debate on the Martin Report, Mr. Malcolm Fraser (then not a minister) said: "In fact, the Committee's proposal is to ... [establish] what, in other countries might well be called junior colleges, which will teach a wide variety of courses up to diploma level".[37] Fraser's impression was that these colleges would cater for less capable students - the students who could not cope with university studies. The colleges were to perform an important socio-economic role: "We would also agree that tertiary education must answer the needs of the modern industrial nation. It must supply the graduates and diplomates, the technologists and technicians to supply the needs of industry".[38]

Here the Government was making its contribution, said Fraser. "The establishment of junior colleges or new look technical colleges in Australia ... will enable more places of higher learning to be established much more cheaply than if we just keep on increasing universities on their present pattern".[39]

---

37. Commonwealth Parliamentary Debates (H. of R.). 1965. 45, p. 459.
38. ibid., p. 958.
39. ibid., p. 959.

Statements such as this left the Government open to partisan attack. It was claimed that the Government was setting up second rate institutions in order to supply industry and commerce with manpower as cheaply as possible. Mr. W. Hayden (A.L.P.) summarized the Opposition's view with the comment: "My concern is that an inferior level - a second rate form - of tertiary education is being proposed to the community as an imitation of the real thing".[40]

In its first report the Commonwealth Advisory Committee on Advanced Education took a strong stand: "We cannot too strongly emphasise that a college of advanced education is not to be confused with the type of college generally known in America as a junior college. Such colleges do, in fact, present courses with recognized end qualifications, but they are confined to pre-university and technician training. We point out that the colleges which we hope to develop in co-operation with the States will offer professional level courses in their own right. Their ability to do so is already well recognized by a wide range of employers and professional institutes".[41] Since then,

40. <u>ibid</u>., p.961.
41. First C.A.C.A.E. Report. <u>op</u>.<u>cit</u>., para 1.31, p.4.

Ministers for Education have gone to great lengths to spell out, very carefully, their Government's perception of the role of the colleges, and the relationship between colleges and universities.

To make the point that Governments expect the colleges to service industry, possibly at the expense of educational excellence it will be necessary to quote extensively from statements made by various ministers and committees.

When Minister for Education and Science, Mr. Malcolm Fraser issued a detailed statement on the differences.[42] He started by stressing that colleges were in no way inferior to universities. They were, he said, different.

> It is probably easier to state the purpose of these colleges than to state the precise differences between them and the universities. Their purpose is to broaden educational opportunities available to students successfully completing secondary school and to provide trained people with a greater variety of talents to meet the growing and diverse needs of industry and commerce and of an expanding, vital and scientific Australia. It is in no way intended that colleges of advanced education should be inferior institutions to universities, nor is it intended that

---

42. Malcolm Fraser. op.cit.

> students entering them should be less able. ... I hope it will be established as time progresses that the colleges offer a genuine alternative and that the students who enter the colleges should not in any sense be regarded as inferior to those entering universities but rather as having qualities and talents of a different kind and whose inclinations lie in a different direction. 43

A major difference, Fraser went on to say, lay in the attitude towards vocational studies:

> It is held by many that courses appropriate to universities are those which demand of students a good measure of analytical and imaginative capacity and that those appropriate to colleges of advanced education are the ones which are more practically oriented. ... If there is a difference in the sort of thing that a student wants to do with his life after he has completed his education. But even this is not precise. ...
> If you look at the universities you will find that a large number of courses are not vocationally directed in this way. Perhaps indeed, a majority are not. While some vocational courses are offered at universities, for the most part they are aimed at developing the qualities of the students who can analyse and reason without passion, without emotion. In some areas this might almost be regarded as the prime purpose of university education. It is a purpose that is different from that of colleges of advanced education. In other words a very large part of university activity is not related to equipping a person with particular talents for a particular job or a particular vocation. 44

---

43. _ibid._, pp. 4-5.

44. _ibid._, pp. 7-8.

The "theoretical" and the "practical" difference comes across in approaches to research. The research that universities do, said Fraser, is usually pure, and done for its own sake, and seldom appropriate to industry:

> If research is to be undertaken in colleges of advanced education, if they are to offer services to industry, I would hope very much that it could be of an applied nature, providing research in areas which are of particular relevance to industry. An essential distinguishing characteristic would be blurred if the colleges were to adopt a significant programme of fundamental research. 45

The fundamental difference, it appears is in the area of the relationship of the educational institution with industry. Fraser said universities should get closer to industry, but his tone indicated that this is not really the answer (perhaps not really possible).

> However whatever might be said about this we should remember the prime university responsibility which I mentioned at the outset: this is to train those with an analytical mind, and to train them to reason rationally and without emotion.
>
> This is a function of limited direct interest to industry. Another limiting factor to the closeness of universities and industry involves those university departments in which fundamental

---

45. <u>ibid</u>., p.8.

> research might be undertaken which it is important to maintain but which might at the same time be of no direct interest to industry - thus there are significant areas of university activity in which the kind of relationship about which I am speaking is not really appropriate. On the other hand neither of these limiting factors should operate in the colleges. Thus industry and commerce should be able to develop closer relationships over a much larger proportion of college activities than would be the case with universities. Already I have heard it said that many industries prefer diplomates from colleges than (sic) graduates from universities, because courses are better orientated to the needs of those industries.
>
> I think it is not going too far to say that the future of the colleges of advanced education will depend very much on the relationships they can establish with industry and commerce in different fields. Their purpose is to fulfil a need and to do this they should have close and continuing liason with the future employers of their students. 46

By issuing so direct an invitation to industry it could be argued that the Minister was opening the way for a reorientation of educational objectives - a reorientation which might value industrial satisfaction above educational excellence. By inviting industry to co-operate to this extent, with the colleges, a potential situation has been encouraged to develop

---

46. ibid., pp. 9-10.

where the interests of a particular industry or industrial concern could perhaps dominate a course in a college of advanced education. With a strongly vocational orientation and the expectation of extremely close college-industrial liason, a situation could develop where students are not educated in a broad sense, but trained in a narrow sense, and given just enough training, and no more, than is necessary to make them useful to a particular industry.

If this was the intention, and one can argue from Ministerial statements that it may well have been, then the establishment of a binary system of tertiary education would be primarily a political and economic phenomenon, and only secondly an educational one.

In his paper on the differences between universities and colleges of advanced education, Professor L.N. Short quotes statements made by Mr. Fraser and each of the State Ministers for Education. They made these statements in responses to a letter on this subject from the Secretary of the Federation of Australian University Staff Associations.[47]

47. L.N. Short. 1972. Universities and colleges of advanced education: defining the difference. Federation of Australian University Staff Associations. (mimeograph).

Mr. Fraser, in 1972 said he was not in agreement with an approach that would put these institutions into what might appear to be "tidy compartments". "Detailing differences between the colleges and universities is not likely to be a fruitful exercise; it could create undesirable divisions. But it is clear that the colleges are more vocationally oriented".[48]

Mr. C. Cutler, the then New South Wales Minister for Education and Science saw the differences between universities and colleges in terms similar to those expressed by Mr. Fraser:

> Traditionally universities have seen their role in both research and teaching, in advancing the frontiers of knowledge and in passing on the fruits of research to new generations. While it is quite obvious that some of the research in universities is in the fields which could be described as practical or applied, and that much of the teaching is in professional areas with a clear vocational intent, nevertheless a main thrust of university research continues to be towards pure rather than applied research, while university teaching puts more emphasis in primary degree courses on the theory of the discipline than on practical skills. The stronger vocational orientation of the colleges is seen not only in the type

---

48. Fraser, quoted by Short, ibid., p.2.

> of institution but also in the approach to teaching within the discipline offered in the institution. Thus, while some of the N.S.W. colleges of advanced education have already become degree granting institutions, their degrees will be of equal standard but of a different emphasis from the majority of university degrees. Furthermore while the Advanced Education Board may, in the future, approve of the awarding of higher degrees by certain of the colleges, the main emphasis of the degrees is likely to be on applied research ... rather than on pure research and advance in theoretical knowledge. In the same way, a difference in the overall emphasis of research interest by staff will be encouraged. In these ways it is appropriate to speak of colleges having a close relationship with commerce and industry. 49

Cutler went on to state that colleges must also provide for a range of courses giving sub-professional qualifications. "It is the view of the Government that these must be maintained and extended in colleges because of the needs in commerce and industry for large numbers of higher technicians and technologists with somewhat less than full professional qualifications".[50]

Other State Education Ministers replied in a similar vein, although the Western Australian Minister

---

49. The Hon. C. Cutler in a letter to the Secretary of the Federation of Australian University Staff Associations, December 23, 1971, quoted by Short. <u>ibid</u>., pp.3-4.

50. <u>ibid</u>., pp.4-5.

said that the "theoretical versus practical" distinction was substantially unreal and that both were concerned with both theory and practice. "What we hope to produce", he concluded, "is a co-ordinated system of post-secondary education deriving from a variety of institutions".[51]

The Karmel Committee[52] had a very concise summary of the difference between colleges and universities:

a) college courses tend to have a more applied emphasis and to be more vocationally oriented;
b) college students can be expected to have vocational rather than academic interests;
c) colleges have more flexible entrance requirements;
d) colleges have a more direct relationship with industry and commerce;
e) colleges are expected to pay more attention to teaching relative to research;
f) colleges provide greater opportunities for part-time studies.[53]

---

51. ibid., p.5.
52. Education in South Australia. Report of the Committee of Enquiry into Education in South Australia 1969-1970. 1971. Adelaide: Government Printer. [Karmel Report]
53. ibid., p.299.

The above standard descriptions will suffice for the purpose of this thesis.

The colleges exist, and have a function which, it is claimed is different from that of the universities, yet attempts to increase the status of the colleges has led to the award of degrees.[54] [In the past, colleges which have awarded degrees have often become full fledged universities, e.g. N.S.W. University of Technology and the British Colleges of Advanced Technology.] In addition to the "functional" differences, certain "structural" (political) differences can be identified.

Structural Differences

Like the universities, the colleges operate under State legislation. The role of the Commonwealth Government is largely that of provider, or more precisely, part-provider of finances.

The Australian Commission on Advanced Education was established by statute in 1971. It superseded

---

54. In July 1972 there were 13 colleges of advanced education awarding degrees. For full details of courses offered in CAEs see A.C.A.E. Report 1972. op.cit., Appendix E, pp. 147-165.

its predecessor, The Commonwealth Advisory Committee on Advanced Education which was set up in 1965 as a result of a recommendation in the Martin Report. Its terms of reference are broadly "to advise the Minister with a view to promoting the balanced development of advanced education, outside the university and teacher education systems, so that the colleges of advanced education may play their part in meeting Australia's needs for education and technologically trained people, and in providing for the needs of students for education suited to their vocations and capacities".[55] Like the Australian Universities Commission, the Australian Commission on Advanced Education (and its predecessor)[56] has reported trienially. Like the A.U.C., it is an advisory body, and like the A.U.C., its advice, by and large, is accepted.

One of the more frequently given pieces of advice is that closer co-operation between the colleges

---

55. First C.A.C.A.E. Report. op.cit., para. 1.10, p.2.

56. C.A.C.A.E. Reports were presented in 1966 and 1969. The A.C.A.E. which came into being on December 9, 1971 produced its only report, to date, in 1972.

and industry[57] must be strongly encouraged. Statements such as "a close and continuous association must be maintained between college staffs and industry on the one hand, and government and business houses on the other"[58] appear frequently in the reports. The Commission stresses, in fact it almost labours the point, that close co-operation is vital. In the second report of the Commission, for example, there are no less than thirty-eight distinct statements, spread through the report, which stress the importance of close co-operation between industry and the colleges.[59] Statements vary from the simple statement of desirability of close co-operation, to statements relating to the role of industry in college policy making e.g.

---

57. "Industry" is used as "a convenient short term to cover primary and manufacturing industry, commerce, government and community services". It is used in this way through the C.A.C.A.E. and A.C.A.E. reports.

58. First C.A.C.A.E. Report. op.cit., para. 2.41, p.23.

59. Second C.A.C.A.E. Report. op.cit., paras. 1.8, 1.9, 1.17, 1.19, 1.20, 1.21, 1.29, 4.1-4.12, 5.5, 5.13, 5.23, 5.25, 5.27, 5.29, 5.30, 5.42, 5.48, 5.49, 6.27, 7.40, 7.41, 8.18, 9.32, 10.10, 10.19, 10.34, 10.35.

> It is pleasing to note the extent to which men and women from government, commerce, community services, and industry have been prepared to participate in the formulation of policy in the individual colleges. These college councils and advisory bodies form strong links with the community and are of vital importance to the colleges. Colleges should make opportunities to strengthen and deepen these contacts. 60

Some statements relate to desirable contacts between academic staff and industry[61] while others relate to the desirable situation of employers giving part time and sandwich students sufficient time off to attend classes.[62] The report encourages Governments to choose governing bodies very carefully: "We think it would be wise for them [Governments] clearly to define the college objectives and to so constitute their councils that with strong representation from employers in industry, business and community services their technological functions will always be uppermost in mind".[63]

It is also desirable, reported the Commission that provision be made for the establishment of light industry in close physical proximity to the colleges and vice versa:

---

60. ibid., para. 1.17.
61. For example, paras. 1.19, 1.20, 1.29, 5.5, 5.13, etc.
62. For example, paras. 5.23, 5.25, 5.30, 10.35.
63. ibid., para 10.10.

> It has been pointed out that a close association is desirable between colleges and industry. This is more easily established if the college site is large enough to provide limited accommodation for developmental work by light industry, for example, scientific instrument manufacture. The South Australian Institute of Technology has entered into a satisfactory mutual arrangement of this type with International Computers (Australia) Pty. Ltd. In Canberra, the N.C.D.C. has reserved an area of about 100 acres alongside the Canberra C.A.E. to foster associations which could be mutually advantageous to light industry and the college. [64]

Courses to be taught must be relevant to employers, and if this is the case, benefits will accrue to the college.[65] In order to ensure that courses are relevant and worthwhile, they must be carefully evaluated by the interested parties.[66] This will also prevent unnecessary duplication.

Industry should exert more pressure on colleges, the report states:

> Senior members of industry can assist the colleges further by their service on their councils and many colleges already benefit from such high level contact. We are inclined to the view that in some colleges, greater representation by industry at council level would be beneficial, particularly if thereby pressure were exerted on the colleges to maintain their contacts with industry, and the colleges were guided as to the characteristics required from graduates. [67]

---

64. ibid., para. 6.27.
65. ibid., para. 5.29.
66. ibid., paras. 5.41 and 5.42.
67. ibid., para. 4.7.

On an earlier page the report stated that "employers have the power to influence the type and quality of graduates from colleges in a number of ways" - and then six examples were given.[68]

Not only do employers and Government have a distinct interest in the educational process, but so too, do the professional associations.

> Professional institutes ... strive to see that their members serve the community ethically and effectively, to seek a high status for their members. ... Many of them - because of their role as qualifying bodies - exercise an influence on the design of university and college courses. The professional institutes have collaborated freely and effectively with the colleges in course design, and college awards frequently qualify the holders for admission to corporate membership. 69

Despite the strong encouragement to industry, the Commission, in its second report felt that employers in Australia (with some notable exceptions) were not accepting as great a responsibility as they

---

68. <u>ibid</u>., para. 4.3. Among the suggestions were included: the sponsorship by employers of work of direct interest to their industry; the service of employers on college councils, academic boards or course design committees; and schemes whereby employers can participate in academic programmes, both as lecturers and students.

69. <u>ibid</u>., para 4.12.

might.[70] Three years later, in the third report, the Commission stated that it was "encouraged by the development of greater co-operation between colleges and industry".[71]

Although the relationship between the educational institutions and industry and the educational institutions and the professional bodies will be examined in detail elsewhere in this thesis, there is evidence to show that Government, and its advisory body has strongly supported and encouraged very close relations between the bodies mentioned. The implications of this for the notion of academic autonomy will be discussed below.

It is of interest to note the recent initiatives of the N.S.W. Government in the field of higher education. In 1969 the Higher Education Act, 1969 was passed.[72] This Act gave the Minister for Education and Science the responsibility for "promotion, encouragement, development, improvement and maintenance

---

70. <u>ibid</u>., para. 10.34.
71. A.C.A.E. Report 1972. <u>op</u>.<u>cit</u>., para. 7.45.
72. N.S.W. Higher Education Act, N.S.W. Statutes. Act No. 29, 1969.

of post-secondary courses".[73] To help him do this, it established an Advanced Education Board and a Universities Board, and a co-ordinating body, The Higher Education Authority.

In examining the functions and power of the Advanced Education Board and the Universities Board, it is obvious that the Government expects to exert much more stringent control over advanced education than over university education. This, perhaps, accords with the opinion that colleges of advanced education are expected to be utilitarian in the extreme, but nevertheless it has strong implications for educational policy making and curriculum development.

Both the Advanced Education Board and the Universities Board have their list of functions prefaced by the words "to make reports and recommendations to the Minister ... with respect to" and the A.E.B. is given seven functions (the first being divided into seven parts) while the Universities Board is given two (both divided into two parts).

The A.E.B. is expected to report with respect to:

---

73. ibid., Sec. 4(1).

(i) the establishment of colleges of advanced education;

(ii) the approval of advanced education courses;

(iii) the fields of studies in which a CAE may offer courses or programs of studies;

(iv) new developments affecting post-secondary education other than university education;

(v) the nomenclature of awards,

etc. 74

The Universities Board, on the other hand, has its function expressed in the most general terms:

> ... to report with respect to:
>
> (a) (i) the provision, maintenance, development, improvement and co-ordination of university facilities.
>
> (ii) the granting of financial assistance to universities. 75

The Advanced Education Board, it can be seen, is expected to approve courses offered by colleges. It is expected to exert tighter control than the Universities Board. As stated above, this has strong implications for educational policy-making and curriculum development, and is relevant in discussing academic autonomy.

---

74. <u>ibid</u>., Sec. 6(1).
75. <u>ibid</u>., Sec. 10.

EFFECT OF DIFFERENCES ON GOVERNMENT

A thorough understanding of the role played by Government, and the respective positions of universities and colleges of advanced education is necessary in this thesis, for the universities and colleges at the moment have equal numbers of engineering students and Government is in a strong controlling position.

While governments exercise financial control, traditional views regard strong attempts at control of courses, or strong statements regarding the desirability of industrial pressure on universities, as inconsistent with acceptable standards of university autonomy.
A second "equal but different" system was created and in this system, with no traditional academic values, it was quite in order to orient and manipulate colleges and courses so that attempts could be made to maximize the harmony between colleges and industry. The Federal Minister for Education and Science conceded that it was not really feasible to influence universities in the same way and insist on so practical and utilitarian a relationship with industry.[76] In taking the position it has, in calling for the satisfaction of the

76. Above, p. 169.

needs of industry, in intimating that only "relevant" courses be taught, government has tried to re-orient educational objectives. Although Australian universities have been described as exceptionally utilitarian, the colleges of advanced education can be described as more _exceptionally_ utilitarian. This utilitarianism can be established by demonstrating that CAE students are cheaper to educate on a _per capita_ basis.

That education has political implications cannot be disputed.[77] The politics of tertiary education in Australia has led to a situation where increasing emphasis is being put on more practical, more vocational and more immediately useful education. By encouraging a system of educational training to do little more than meet the needs of industry (as has been claimed to be the case in advanced education) Government has been able to provide a cheaper sort of institution which

---

77. Countless books and papers are written with titles such as "The Politics of Education", "Education and Politics", etc. For a good bibliography see G.S. Harman. 1970. Education and the Political System. Paper presented at the Twelfth Annual Conference of the Australasian Political Studies Association, Canberra. (mimeograph). See also Harman and Selby-Smith. _op.cit._, p.187.

produces a product for the present socio-economic and industrial system. It could be argued that Government, by continually increasing its relative commitment to Advanced Education is not only satisfying a number of economic needs, but also acting expediently in trying to ensure stability in the socio-political system.

SUMMARY

In recent years the Commonwealth Government has increased substantially its financial contribution to higher education. Its involvement in planning has extended to its setting up the binary system that presently exists. In increasing its functions it has assumed control of higher education, and this raises questions regarding autonomy.

Government's major interest is to see that people who are very closely attuned to the community's occupational structure are produced by the universities and colleges. This interest arises out of the view that education is an economic investment and related to Australia's industrial growth. It is Government's interest then, to try to influence the system to ensure that the education provided is satisfactorily vocational and utilitarian. It does this through the provision and control of funds.

The Commonwealth Government's acceptance of the Murray and Martin Reports and the statements made over the years by Ministers for Education indicate that planning and policies are oriented to providing, as far as possible, for education that is utilitarian and oriented to industrial development.

In addition Government expects a substantial research output from the universities. Interests with regard to the CAEs are somewhat different. With regard to the CAEs Government expects:

(a) an increase in size vis à vis the universities. This appears desirable because Government feels it can justifiably exercise more control over the direction of CAE courses, and ensure that they are industrially oriented. Further, on a student per capita basis, CAE courses are cheaper to establish and maintain.

(b) that industry will strive to make sure its needs are satisfactorily met. The Second Report of the C.A.C.A.E. stressed this point. The establishment of an Advanced Education Board in N.S.W.

shows that Government will not support any course unless it can be shown that there exists a definite industrial need.

(c) that the colleges of advanced education will very rapidly increase their status. Several colleges are now awarding degrees.

Now and in the future there is the possibility of a clash of interests between Government and the educational bodies. Government provides substantial funds and in acting to guard taxpayers' money, lets its expectations regarding the educational system be known. This may result in direct or indirect influence.

Government, then, has a set of interests. These interests can be thought of in terms of influences that are brought to bear on the educational institutions. They are important in determining curricula. They are non-academic influences.

CHAPTER VII

INTERESTS AND ACTIONS OF THE INSTITUTION OF ENGINEERS, AUSTRALIA

> The unity of the engineering profession owes much to the existence of the Institution of Engineers, Australia; a single Institution which defines limits for the profession and which influences the various educational bodies by setting minimum standards of education recognized for qualification.
>
> – (Associate Professor) R.L. Aston, Foreword to B.E. Lloyd. The Education of Professional Engineers in Australia. p.6.

INTRODUCTION

A professional association, in its search for status, displays the characteristics of an interest group vis à vis the educational bodies. It will be shown in this chapter that status is the key issue in professionalization, and that professional associations believe that status is related to (among other things) quality and quantity of education. What happens in the educational bodies then, is of vital interest to the professional associations. Hence one would expect, and it will be shown, that the association attempts to influence the educational process.

An important aim of a professional association is to envelop itself with an air of exclusiveness so that it can set itself apart from pretenders to its professional status. This is successfully achieved by inducing an air of solidarity and using this solidarity to ensure agreement on a particular entry standard. A barrier is built up, and to overcome this obstacle, prospective entrants must meet certain requirements relating usually to qualifications, type of education, and acceptance of standards of group membership and professional behaviour.

In Australia, Government has encouraged professional associations to "exercise influence on the design of university and college courses" (see above, p.179). With this encouragement (though not because of it) and despite some resentment from academics (see below, Chapter IX) the I.E.Aust. has become the accrediting body and wields great influence on engineering courses in the universities and colleges. The interests and actions of the I.E. are major determinants in planning engineering courses, and in order to understand this, it is important to understand not only what the association's interests are and how they are presented to the educational authorities, but also the whole range of activities pursued by the professional body.

This chapter deals with professional associations in general; background to the I.E.Aust.; status considerations in general; the Royal Charter; registration of engineers; education and status; the I.E. as a learned society; the I.E. as a protective body or trade union; accreditation and the I.E.; Discussion; and a Summary.

PROFESSIONAL ASSOCIATIONS

The origins of the professional associations for scientists and engineers go back to the early 19th century. The first engineering Institution to be set up was the Institution of Civil Engineers which was formed in 1818.[1] Since then, Institutions of

1. Carr-Saunders and Wilson. op.cit., p.157 discuss how it arose out of dissatisfaction with the Society for Civil Engineers which was formed in 1771, but was no more than an informal dining club. It was not deemed to be adequately serving the needs of Civil engineers. See also Millerson. op.cit., p.57.

Engineers have grown up in a number of disciplines and have played a variety of roles.

Professionalization, as described above, is the process by which an occupation becomes a profession, i.e. the acquisition by the occupational group as a whole of many or most of the seventeen definitional characteristics listed in Chapter II (above, p. 28). This acquisition of a set of occupational and behavioural norms entails conformity, and as Millerson has said, forming an association is "the easiest method of inducing a normative pattern".[2]

Millerson discusses a number of functions of professional associations. He summarizes them as:

Primary functions:[3]

1. To organize;
2. To qualify;
3. To further study in a subject and communicate information obtained;
4. To register competent professionals;
5. To promote and preserve a high standard of professional conduct.

---

2. ibid., p.10.
3. ibid., pp.28-30.

Secondary functions:[4]

1. To raise professional status;
2. To control entry to the profession;
3. To protect the profession and the public;
4. To act as an interest group for its members;
5. To encourage social activity and co-operation among professionals.

Not <u>all</u> professional associations fulfil <u>all</u> of these functions. Millerson describes four of the sorts of associations that perform some of these functions.

1. Prestige associations - usually an elite, closed group with broad aims e.g. The Royal Society;[5]
2. The Study Association - an association to further knowledge in a specific subject area e.g. The Royal Geographic Society, The Royal Chemical Society;[6]
3. Qualifying Associations - they aim to examine and qualify individuals wishing to practice the subject e.g. Institutions of Engineers, Colleges of Physicians etc.;[7]

---

4. <u>ibid.</u>, pp. 30-32.
5. <u>ibid.</u>, pp. 33-35.
6. <u>ibid.</u>, pp. 35-37.
7. <u>ibid.</u>, pp. 37-39.

4. Occupational associations - associations that co-ordinate and protect members of an occupational or professional group e.g. Australian Medical Association, trade unions etc.[8]

The concern in this thesis is with the way in which educational decision making in engineering is subject to non-academic pressures, and as such, activities that would be described as falling under the area covered by qualifying associations will be dealt with in greater detail.

Issue can be taken with Millerson's classification of the raising of professional status as a <u>secondary</u> function of a professional association. Any professional association, it can be argued, is concerned <u>primarily</u> with status. All of its activities can be subsumed under this heading, as the search for increased status (or at least the maintenance of its present status) involves an emphasis on qualifications and codes of professional behaviour. As qualifications and behaviour standards determine the profession's

---

8. <u>ibid</u>., pp. 39-41.

standing, it is in the association's interest to exert some influence with regard to the way qualifications are awarded, and behavioural patterns inculcated.

The Institution of Civil Engineers (founded 1818) was the first modern qualifying association, and according to Millerson, was founded to consolidate and increase status for a body of practitioners.[9] Other professional bodies followed shortly after e.g. The Royal Institute of British Architects (1834), The Pharmaceutical Society of Great Britain (1841), The Royal College of Veterinary Surgeons (1844) etc.

The Institution of Civil Engineers was concerned mostly with static engineering, and in 1847 the Institution of Mechanical Engineers was formed to cater for a different speciality. As more specialities gained more practitioners the move to consolidate strengthened, and a number of new Institutions was formed e.g. The Institution of Naval Architects, 1860; The Institution of Electrical Engineers, 1871; The Institution of Mining Engineers, 1889; The Institution

---

9. ibid., pp. 56-58. c.f. movements founded to achieve status.

of Sanitary Engineers, 1895; The Institution of Water Engineers, 1886; The Institution of Heating and Ventilating Engineers, 1897; The Institution of Gas Engineers, 1902; The Institution of Automobile Engineers, 1906; The Institution of Structural Engineers, 1908; The Institution of Aeronautical Engineers, 1920; The Institution of Chemical Engineers, 1927; The Institution of Agricultural Engineers, 1930.[10] These Institutions, and others which cover a very wide range of specialities are affiliated with the Engineers Guild, which has no study function, but is concerned mainly with professional protection.

In Great Britain one major stated function of the associations is to co-operate with educational bodies in drawing up syllabuses and courses and in providing representatives to sit on the various governing bodies of the educational institutions. The Constitution of the Institution of Mechanical

---

10. Carr-Saunders and Wilson. op.cit., pp. 161-162. Millerson. op.cit., has a more detailed list in Appendix 1 - several of the dates differ see pp. 226-230. The dates given are dates of founding. For dates of incorporation see Carr-Saunders and Wilson. loc.cit., and Millerson. loc.cit.

Engineers lists as one of its functions "to co-operate with Universities, other Educational Institutions, and public educational authorities for the furtherance of education in engineering science or practice".[11] The Institution of Chemical Engineers sees one of its functions as "to co-operate with Government Departments, Universities, other Educational Institutions and public education authorities for the furtherance of knowledge and of education in Chemical Engineering science or practice".[12]

In the United States there are also a large number of engineering Institutions. No one Institution represents the profession, and two peak bodies have been formed by the various Institutions.

1. The Engineers' Council for Professional Development (E.C.P.D.). The major activity of the E.C.P.D. is accreditation of engineering curricula. The E.C.P.D. was formed in 1932 as a result of recommendations of the Wickenden Report.[13] It

---

11. Quoted in Prandy. op.cit., p.67.
12. Quoted in ibid., p.67.
13. Details can be found in Everitt. 1971. op.cit.

is an offshoot of The American Society for Engineering Education (formed in 1893 as the Society for the Promotion of Engineering Education) which provides a forum for discussion of problems in engineering education.

2. The Engineers' Joint Council which has a membership of Engineering Societies and has a broad scope in acting as a protective occupational group.

THE INSTITUTION OF ENGINEERS, AUSTRALIA - BACKGROUND

Australia's major professional engineering association, The Institution of Engineers, Australia (I.E.Aust.) came into being in 1919. Its beginnings however, were evident almost 50 years earlier. In Sydney in 1870 "leading members of the mechanical engineers and iron trades" formed a society for the "friendly interchange of opinions, ideas and knowledge".[14] This became the Engineering Association of New South Wales, Australia's first engineering society. It was some years before there was another engineering

---

14. Corbett. 1969. op.cit., p.141.

body, the Victorian Institute of Engineers (1883) and after that came many more - 1889 The Melbourne University Engineering Society, and 1886 saw a Mechanical Engineers Association formed in Queensland. This, soon after, was wound up and reconstituted in 1911 as part of the Queensland Institute of Engineers (founded in 1900). 1895 saw the foundation of the Sydney University Engineering Society. A Northern Engineering Institute was formed in Newcastle in 1889, became defunct, and was reformed in 1908. 1909 saw the Western Australian Institution of Engineers and the Institute of Local Government Engineers of Australasia; 1913 the South Australian Institute of Engineers; 1914 the Electrical Association of Australia; 1918 the Tasmanian Institute of Engineers.[15]

In 1910 there was a move urging the formation of an Australia-wide Engineering Institute.[16] Discussion of this proposal continued until a conference was held in Melbourne in February 1918.[17] At this conference the need for a national body was

---

15. ibid., pp. 141-2. Lloyd. op.cit., p.54.
16. P. Tait writing in the Australian Mining and Engineering Review, quoted by Corbett. op.cit., p.142.
17. ibid.

debated as were arguments relating to a strong federal body versus a weak federal body. A provisional council of the proposed Institution of Engineers met in Sydney in May 1918 to begin drafting a constitution.

A draft constitution was produced on March 13, 1919, and was sent to each engineering society with an invitation to become a foundation society before August 1, 1919. The following societies accepted the constitution:[18] The Electrical Association of Australia; The Institute of Local Government Engineers of Australasia; The Engineering Association of New South Wales; The Melbourne University Engineering Society; The Northern Engineering Institute of N.S.W.; The Queensland Institute of Engineers; The South Australian Institute of Engineers; The Sydney University Engineering Society; The Tasmanian Institution of Engineers; The Western Australian Institution of Engineers.

These became foundation societies and delegates from them attended the first Council meeting on

---

18. Institution of Engineers, Australia. <u>Petition for the Grant of a Royal Charter</u>. Sydney. I.E.Aust., para. 1.

October 20-21, 1919,[19] where Professor W.H. Warren, Dean of the Faculty of Engineering, University of Sydney, was elected first President of the Institution.[20]

While it was argued that the new Institution was fully representative of Australian engineers,[21] one of the earliest difficulties was concerned with reaching an agreement on membership. It was resolved that all persons who were members of the foundation societies were entitled to membership of the new Institution - those under the age of 25 to be classed as students or graduates (juniors) - those over the age of 25 to be given full corporate membership (associate membership).[22] Fifty years later, the

---

19. Corbett. op.cit., pp. 141-143; Lloyd. op.cit., pp. 53-55. A more detailed account can be found in the Journal I.E.Aust. 1920. 1, pp. 28-40. A history of the I.E.Aust. has been prepared by Professors Corbett and Moorhouse, and is currently in press.

20. Journal I.E.Aust. 1920. 1.

21. Three societies decided against joining - the Australasian Institute of Mining Engineers, the Victorian Institute of Engineers and the Institute of Local Government Engineers.

22. Corbett, op.cit., p.143.

President of the Institution in the Jubilee Address contrasted the meagre beginnings of the Institution of Civil Engineers in 1818 with the "flying start" of the I.E.Aust. which had a foundation membership of 1757.[23] Earlier, however, concern was expressed that at its foundation the I.E.Aust. admitted many members who later, would not be deemed to have qualifications suitable for entry.[24] Arguments over standards of membership have occupied much of the time of the Institution since its inception.

The objects of the Institution are explained at length in the Royal Charter of the Institution of Engineers, Australia. Paragraph 4 says

> The objects and purposes of the Institution are to promote and advance the science and practice of engineering in all its branches and to facilitate the exchange of information and ideas in relation thereto and for that purpose. -
>
> a) To raise the character and status and advance the interests of the profession of engineering and those engaged therein.
>
> b) To increase the confidence of the community in the employment of recognized engineers by admitting to The Institution only such persons

---

23. I. Langlands. 1969. Fifty years of the Institution of Engineers. Journal I.E.Aust. 41, p.137.

24. Institution of Engineers, 1946, Annual Report. Journal I.E.Aust. 18, pp.2-4.

as shall have satisfied the Council of The Institution that they have an adequate knowledge of both the theory and practice of engineering.

c) To promote honourable practice to repress malpractice and to settle disputed points of practice and to decide all questions of professional usage and etiquette affecting members of The Institution.

d) To collect and circulate statistics and other information relative to engineering in all its branches.

e) To provide for the delivery and holding of lectures, exhibitions, public meetings, classes and conferences calculated to advance education in engineering whether general professional or technical and to employ lecturers, teachers and other persons for these purposes and to pay all expenses professional or otherwise in connection therewith.

f) To encourage the study of engineering and to improve and elevate the general and technical knowledge of persons engaged or intending to engage in the profession of engineering and for such purposes to test by examination or otherwise the competence of such persons and to donate on such terms and conditions as may from time to time be prescribed prizes or other awards or distinctions and grant certificates and institute and establish scholarship grants and other benefactions and to provide for the registration by The Institution of holders of such certificates.

g) To establish,form, furnish and maintain libraries, museums and laboratories.

h) To communicate to members information on all matters affecting the profession of engineering and to print, publish, issue and circulate such papers, periodicals, books, circulars, leaflets and other literary undertakings as may seem conducive to any of the objects of The Institution.

i) To encourage the discovery of and investigate and make known the nature and merits of processes and inventions which may seem capable of being used by persons engaged in the profession of engineering.

j) To originate and promote improvements in the law and to support or oppose alterations therein and to effect improvements in administration and for the purposes aforesaid to petition the Crown or any legislative body or authority and to promote deputations and take such other steps and proceedings as may be deemed expedient for the furtherance of any of the objects of The Institution.

k) To promote and safeguard the interests of the profession of engineering generally.

l) To do all such other things as The Institution may think incidental or conducive to the attainment of the above objects or any of them. 25

These stated objects coincide with many of Millerson's primary and secondary functions of qualifying associations. The objects of the I.E.Aust. may be summarised very roughly as:

1. To act as a status maintaining or improving body (a, b, c).
2. To act as a learned society (e, f, g, h, i).
3. To perform a protective or trade union function (h, j, k).
4. To act as an accrediting or qualifying body (b, f).

---

25. Institution of Engineers, Australia. Royal Charter and Bye-Laws. Sydney. pp.11-12.

STATUS

(i) General

Most definitions of professions include high status ranking as an important factor. Status and prestige, on the one hand, and professionalism on the other are often treated synonymously. In turning one's attention to engineering, one is confronted with a situation in which the engineer feels that his status is not high enough and that the community does not understand the engineer's professional role and position and hence, accords him low status.[26]

In status ranking tables and stratification scales, professional engineers have not fared badly. Congalton found that of 134 occupations ranked by a Sydney sample, "professional engineer" ranked ninth.[27]

---

26. This observation is made on the basis of the author's interviews with engineers, in the correspondence columns of engineering journals, and in works on engineering published in the U.S.A. and U.K. e.g. Perrucci and Gerstl. 1969. Profession without Community: Engineers in American Society. New York: Random House, pp. 32 and 57; Gerstl and Hutton. op.cit., p.112.

27. A.A. Congalton. 1969. Status and Prestige in Australia. Melbourne: Cheshire. pp. 56-62.

"Engineer" ranked below professions such as doctor, university professor, solicitor, architect, dentist, but above university lecturer, veterinary surgeon, school principal, public accountant, newspaper editor etc.[28] A similar British survey ranked professional engineer eighth.[29]

Although survey material shows community perception of engineers' status as quite high, engineers in Australia and Great Britain claim it is not high enough and that efforts should be made to improve it. To this end, the Institution of Engineers, Australia has expended a great deal of energy. In the Jubilee Presidential Address to the I.E.Aust., I. Langlands said that the problem of how to increase the status of the engineer has been discussed more than any other problem since the inception of the Institution.[30] Although the status of a profession will be related to the service it provides, this in turn will be related to the standards of the professional association,[31] especially its entry standards.

---

28. ibid.
29. Gerstl and Hutton. op.cit., p.115.
30. Langlands. op.cit., p.139.
31. Millerson. op.cit., p.30.

The I.E.Aust., in an attempt to raise its status has, over time,

(a) striven for a Royal Charter,

(b) supported proposals for State registration of engineers,

(c) issued policy statements on entry standards, and on desirable characteristics of professionals and sub-professionals.

(ii) Royal Charter

A Royal Charter has often been regarded as particularly valuable for a profession, for in addition to conferring prestige, it is a means of regulating a profession, especially in terms of education, and training future professionals.[32] In the first year of its existence, the Council of the I.E.Aust. proposed that the Institution endeavour to obtain a Royal Charter of Incorporation.[33] The question was pursued in the following years and discussed in the Institution's Journal.[34]

---

32. Sir Peter Venables. 1967. The technological universities and education for the professions. Universities Quarterly. 22, p.54.

33. Corbett. op.cit., p.145. Lloyd. op.cit., pp. 54-55.

34. For example see Journal I.E.Aust. 1931. 3, p.259; see also Presidential Address. 1932. Journal I.E.Aust. 4, p.96.

The Charter was granted in 1938 and gave the Institution the right to set qualifications for entry to the profession in Australia[35] and to act as a learned society.[36] Members were entitled to the "exclusive use" of the letters Hon.M.I.E.Aust., M.I.E.Aust., A.M.I.E.Aust., etc. (depending on member's designation)[37] and all corporate members of the Institution were permitted to use the title of "Chartered Engineer (Australia)".[38] In the Jubilee Presidential Address, the President described the Royal Charter as "undoubtedly the greatest contribution towards raising the status of the Institution, and through it of the profession".[39]

While activity directed towards the attainment of the Charter was taking place, attempts were being made to raise the status in a more tangible way - by attempting to secure State registration of engineers.

---

35. Royal Charter. para. 4b.
36. ibid., paras. 4e,f,g. et seq.
37. ibid., para 7. The designations were changed in 1968. See Bye-Laws. No. 2. et.seq.
38. Royal Charter. para. 8.
39. Langlands. op.cit., p.139.

(iii) Registration

Engineers are registered in only a small number of countries[40] and, generally speaking, anyone can call himself an engineer. In interviews with professional engineers, the author found some engineers perturbed by this, seeing it as a great threat to their status. Others were not so perturbed, claiming that a non-professional engineer poses no threat as he cannot do the same work. If one is not a satisfactorily qualified engineer, those responsible for allocating work would be fully aware of this fact. This opinion, however, skirts the status position and is very much a minority opinion and a relatively recent one, for in the early years of the Institution's existence great efforts were made to have engineers registered.

In the first Presidential Address, Professor Warren called for legal protection for the profession.[41] Registration became a theme for many more Presidential

---

40. A. King. 1966. Licensing of professionals. In Vollmer and Mills. (Eds.). op.cit., p.298, lists (in 1966) Belgium, Greece, Italy and U.S.A. as countries where engineering is regulated by law.

41. Corbett. op.cit., p.145.

Addresses. Drafts of Bills were prepared by the Institution and presented to the State Parliaments,[42] and until registration could be achieved, interim measures were suggested. In the 1930 Presidential Address D.F.J. Harricks said, "One of the Institution's most important functions is to classify its members, as it realises that until some more definite means of identifying the professional engineer is devised, The Institution must safeguard the public against exploitation by the untrained man. The classification of its members is based not merely on examination, but, very largely too, on individual demonstration of ability in practice. Therefore classification by The Institution is probably a greater guide to the public than is the case with any other profession".[43]

W. L'Estrange echoed Harrick's sentiment of safeguarding the public against unqualified persons,[44] but went a step further. He suggested that governments may not always be ideally suited to determine who meets the requirements for registration, and in fact,

---

42. _ibid_.
43. _Journal I.E.Aust_. 1930. 2, p.85.
44. W.M.E. L'Estrange. 1934. Registration of engineers and other matters. _Journal I.E.Aust_. 6, p.179.

the Institution was the ideal body to do this.[45] To give the Institution such a legal role would put registration into the hands of engineers rather than in the hands of civil servants.

The 1935 Presidential Address was given by H.G. Jenkinson, and was entitled "Some Introspective Observations on the Status of Professional Engineers".[46] Jenkinson argued that registration was the key to greater status, particularly because "engineering" is a vague term and further, that "educational and technical qualifications should be maintained, and back-door entrances to the profession should be closed".[47]

The only instance of sufficient pressure being brought to bear on a government to legislate for registration was in the State of Queensland where, according to A.H. Corbett, Professor R.W. Hawken, Professor of Engineering, University of Queensland, and past president of the I.E.Aust. had sufficient influence to ensure passage of a Registration Bill.[48] The Bill was

---

45. _ibid._
46. H.G. Jenkinson. 1935. Some introspective observations on the status of professional engineers. _Journal I.E.Aust._ 7, pp. 127-133.
47. _ibid._, p.132.
48. Corbett. _loc.cit._

passed in December 1929 and it provided for the setting up of a Registration Board consisting of six members - three to be nominated by the Minister for Public Works (one of these three to be the Professor of Engineering at the University of Queensland), and three to be elected by practicing professional engineers.[49] The Act, which became law in August 1930 protected the titles "professional engineer" and "consulting engineer".

Queensland was the only Australian State ever to achieve registration, and for some time after the Queensland success, engineers in other States tried to emulate the Queensland feat. In the 1938 Presidential Address, J.M. Crawford said that despite the achievement of a Royal Charter, status was still indeterminate and a higher status was desirable. This would come only if a uniformly high standard of entry to the profession was achieved and maintained. This could best be attained by State registration of engineers.[50]

---

49. Full details of the Bill can be found in Journal I.E.Aust. 1930. 2, p.110. See also Journal I.E.Aust. 1938. 10, p.222.

50. J.M. Crawford. 1938. Presidential Address. 1938. Journal I.E.Aust., 10, pp. 218-222.

The 74th meeting of the Council of the Institution (1938) reaffirmed the desirability of registration. The minutes reveal an interesting attitude:

> The discussions which ensued appeared to indicate that, were there a possibility of securing a form of registration which would <u>restrict the practice of the profession of engineering</u> to those registered as qualified practitioners, the movement would receive unqualified support. There was however, an apparent lack of unanimity on the wisdom of supporting any movement which had a limited objective. 51 (emphasis in original)

Despite early doubts about the Royal Charter raising status, the movement to secure registration began to fade after 1938 although the Council Standing Committee on Registration was reappointed annually until 1947.[52] The matter finally came to rest when, following a study in 1961-1962, the Council made a statement saying that it no longer supported the legal registration of engineers, and preferred the situation that existed in Australia in which the profession controlled itself through the Institution.[53]

---

51. Journal I.E.Aust. 1938. 10, p.233.
52. Corbett. loc.cit.
53. Registration of Engineers. Journal I.E.Aust. 1963. 35, pp. N35-N43.

It could be argued that if the protection of status was to be placed in the hands of a registration board, it might reflect on the quality of past accrediting practices of the I.E. In the long run, also, the accrediting role of the I.E. could then be diminished. Any diminution of I.E. vigilance over educational levels would not be viewed favourably by the I.E.

(iv) Education and sub-professionals

Long and thorough papers have been devoted to showing that professionals believe that status is directly related to quality and quantity of education,[54] and thus it follows that if the Institution is to work for higher status for the profession, it must be involved in determining, or at least approving educational standards. In his Presidential Address to the Institution in 1956, R.W. Parsons said "The Institution of Engineers, Australia, as would be expected, has given its most earnest consideration to ensure that engineers of the future shall be adequately

---

54. F.G.A. Sublet. 1936. The Institution and Engineering Education. Journal I.E.Aust. 8, pp. 123-136, is one example.

prepared to uphold the status of the profession and to take their places as responsible units of the society".[55]

A statement such as this implies that the Institution is concerned with more than just technological knowledge as part of the professional socialization process. A satisfactory solution, it appears, can only be achieved if entry standards are adequately maintained and not threatened.[56] (Entry standards and accreditation are discussed below).

One important element in clarifying the status position has been to state the position vis à vis professionals and sub-professionals. At the 152nd meeting of the Council (1957) the following was resolved:

---

55. R.W. Parsons. 1956. The engineer and his education. Journal I.E.Aust. 28, p.89.

56. Crawford. op.cit., p. 220. W.R. Nimmo. 1938. Chairman's Address. Brisbane Division, I.E.Aust. Journal I.E.Aust. 10, pp. 301-305; A. Burstall. 1937. Journal I.E.Aust. 9, pp. 275-279; E.J. Crawford. 1938. Journal I.E.Aust. pp. 273-4. A. Burstall. 1938. Journal I.E.Aust. 10, p.307. Sublet. op.cit., p.124.

> 1. That the Institution considers that there is an acute shortage of technicians and supports proposals for their training.
>
> 2. That it considers, however, that courses designed for the training of <u>technicians</u> should be suitably designed so that the possibility of confusion with the training of <u>professional engineers</u> may be avoided.
>
> ...
>
> 4. That the foregoing be conveyed to the appropriate educational authorities. 57

Council has continued to clarify the position. A detailed statement in 1965 defined the role of the technician, suggested a national accrediting body, made some comments on the type of education that would be suitable, and concluded by suggesting that the word "technician" be included in the title of the award e.g. "Engineering Technician Certificate in Applied Electricity" rather than the present designation "Certificate in Electrical Engineering" etc.[58]

Council went a step further in 1968 when at the 194th meeting it agreed to accept the responsibility of establishing a committee for the accreditation of

---

57. <u>Journal I.E.Aust</u>. 1957. 29, p.238.

58. "Engineering Technicians" - statement approved by the Council of the Institution. April 1965. <u>Journal I.E.Aust</u>. 1965. 37, p.N73.

courses for technicians, providing that funds (from outside sources) be made available for this purpose.[59] This would give the profession a dominant position in the determination of status of the sub-professional vis à vis the professional.

(v) Other status considerations

That status is a sensitive point has been shown above.[60] Many select committees have been set up;[61] suggestions have been made to try to emulate other professions' status security,[62] and many papers have been written highlighting the problems, and sometimes

---

59. Journal I.E.Aust. 1968. 40, p.N7.

60. Another quaint example of sensitivity can be found in an editorial Journal I.E.Aust. 1952, 24, p.173 where The Sydney Morning Herald is berated for suggesting that the soon-to-be appointed Commissioner of Railways should be an administrator (rather than an engineer).

61. For example the Status of Engineering Committee set up by the 104th meeting of the Council. Journal I.E.Aust. 1945. 17, p.194.

62. Sublet. op.cit., p.124 suggests engineering should follow medicine in entry, registration, ethics etc.

offering solutions to the perceived status crisis.[63]

The Institution has produced a very revealing editorial on the matter.[64] Two strands of thought stand out.

> a) The Council has done much to raise the prestige of the Institution and the status of the profession. It has safeguarded the standards of qualifications for professional engineers, raising the requirements for admission to the various grades from time to time to meet world standards and advances in scientific and technological developments. It publishes technical material of high quality. ... This year it has increased the number of its publications, essentially to enhance the standing of the Institution and its members. ... It makes representations to governments on a variety of matters of public importance ... it conducts a conference ... The Council and the Divisional Committees continually discuss further means by which status may be enhanced. [65]

---

63. In addition to many of those cited above see J.C. Stobie. 1941. Engineers and education. Journal I.E.Aust. 13, pp. 248-250; O.F. Blakey. 1946. Presidential Address. Journal I.E.Aust. 18, pp. 37-40; Nimmo. op.cit.; E.M. Goodger. 1966. How respectable is the Faculty of Engineering. The Australian University. 4, pp. 37-43.

64. To raise the status of the profession of engineering. 1958. Journal I.E.Aust. 31, pp.N57-58.

65. ibid., p.N.57.

> b) As professional men we are often judged not only on our academic qualifications and technical competence, but on a host of smaller and often very minor details associated with our appearance, bearing, habits and family life. We are often so judged by employers as well as by the general public. We cannot afford to be either careless or flamboyant in our dress. In a democratic community those who wish to sponsor dress reform are at liberty to do so, but they cannot complain if they are not recognized as professional men. [66]

The editorial continues on how status is often judged on standards of dress, speech, and stationery used for written communication etc.[67]

The two elements of professional socialization - academic and technical standards, and attitudinal and behavioural characteristics play a very significant role in the Institution's search for greater status. These two elements indicate the objects of the influence the Institution would wish to be able to exert on educational bodies in their production of future professionals.

It has been shown in this section that the search for increased status is a matter of great concern

---

66. <u>ibid</u>., p.N.58.
67. <u>ibid</u>.

to the engineering profession, and thus likely to be used as an explanation for some of the Institution's actions in dealing with the universities and colleges, and government departments.

LEARNED SOCIETY FUNCTION

A second objective of the Institution of Engineers, Australia is to act as a learned society. The Charter very explicitly gives it this function.[68] The Institution is to provide for the "delivery and holding of lectures, exhibitions, public meetings, classes and conferences ... to encourage the study of engineering ... to establish, form, furnish and maintain libraries, museums and laboratories ... to print and circulate such papers, periodicals, books, circulars, leaflets ..."[69] The extent to which an organization provides study facilities depends on many factors - available finance; subject matter; members' needs: alternative sources of information - and typical facilities include lectures and discussion meetings, study groups, conferences, conventions, visits, library, publication of a journal etc.[70]

---

68. Royal Charter. paras. 4e, f, g, h, i.
69. ibid.
70. Millerson. op.cit., p.29.

From the start the I.E.Aust. has played a learned society role. During its first full year of existence (1920), fifty-one papers were read, and it was recorded in the First Annual Report that "the Council had noted with satisfaction the large number and high standard of the papers presented".[71]

The Institution provides a forum for the reading and publication of papers, and publishes voluminous Transactions. Professor Roderick sees the most obvious function of the Institution as that of disseminating information. He expresses a concern, however, that not enough non-academic members are actively involved in society functions, and that most of the papers read and published come from academics.[72] This, of course, is not a problem exclusive to Australia. If, as Roderick suggests, those charged with ensuring that the Institution performs its learned society function are mostly academics, the outcome, in terms of a professional socialization experience

---

71. Quoted in Langlands. op.cit., p.138.

72. J.W. Roderick. 1970. Engineering in broad concept. Journal I.E.Aust. 42, p.19.

would be not unlike that of the colleges and universities.

PROTECTIVE OR GUILD FUNCTION

As well as enveloping themselves with an air of exclusiveness, professional groups try to secure a better place in the power structure of the community and, as a result, engage in pressure group politics. The sorts of activities in which the I.E.Aust. engages relate mainly to questions of status and as a corollary to this, an almost eternal vigilance over entry standards and educational qualifications.

The Institution has, as members, approximately 75% of Australian professional engineers,[73] and as such, says Professor Roderick, the Institution is truly representative of the profession, able to speak for it in public, to act on its behalf, to work for its best interests, and to ensure that it is an effective force in the service of the community. Thus, says Roderick, the Institution and the profession are synonymous.[74] Engineers, because they are

---

73. ibid.
74. ibid.

professionals, a former president of the Institution argued, should have more of a say in the community and in government.[75]

Because of its large membership covering all branches of engineering, Professor Campbell-Allen says the I.E.Aust. can present to Governments an unambiguous engineering viewpoint.[76] In surveying the performance of the Institution after fifty years, I. Langlands said that although the Institution speaks and acts on behalf of the profession, the spokesman function has been the least successful aspect of the Institution's performance.[77] In an editorial in the Journal, it was claimed that the Council does not engage in broad scale political activity - "The Council would be exceeding its powers if it attempted to enter fields which are essentially political or industrial and which concern members as citizens rather than as professional engineers".[78]

The Institution has claimed not to be a trade union, and has followed the lead of the (British)

---

75. A.J. Gibson. 1933. Presidential Address. Journal I.E.Aust. 5, p.164.
76. Campbell-Allen. op.cit., p.73.
77. Langlands. op.cit., p.139.
78. Editorial. 1958. How effective is the Institution? What is the policy of Council? Journal I.E.Aust. 30. p.331.

Institution of Electrical Engineers which claims: "It will be seen from the terms of the Royal Charter that The Institution being constituted to promote the general advancement of service, cannot act in matters touching the personal gains of individual members".[79] This attitude has shaped somewhat of a dilemma in Institution ranks. There has always been the strong belief that engineers should be more adequately remunerated, but that it was not the role of the Institution to see to this.[80] If engineers were to get more money, it could be argued that they would have more status, and hence one of the major stated aims of the Institution would be fulfilled.

In 1946 a body called the Association of Professional Engineers, Australia (A.P.E.A.) was founded to perform the trade union function - to seek higher remuneration and better conditions for engineers. Its chief aims are to establish and maintain conditions which will:

> Enable all professional engineers to maintain a standard of living and a status in keeping with the reasonable needs of a professional man;

---

79. Quoted in Prandy. op.cit., p.73.
80. Journal I.E.Aust. 1938. 10, pp. 261-2.

> Enable and encourage professional engineers to perform their duties with maximum efficiency and thereby to gain full vocational satisfaction ... [81]

To achieve these aims the following policies are used:

> Consolidation, extension, and improvement of salary levels already gained by the Association through arbitration proceedings and negotiations;
>
> Establishing conditions of employment appropriate to professional work ... [82]

The A.P.E.A. was formed following the appointment by the Institution of a Field Officer to assist in matters mentioned above.[83] The first major success of the A.P.E.A. came in 1961 when the Commonwealth Conciliation and Arbitration Commission handed down a Federal award for members. Among other things this award recognized the Institution as the qualifying body for engineers in Australia.[84]

---

81. Lloyd. op.cit., p.29.
82. ibid.
83. For details see ibid., pp. 28-31; and Corbett. loc.cit.
84. C.E. Moorhouse. 1964. Engineering courses in Australian universities - general survey. The Australian University. 2, p.247; S.Encel. 1964. Social implications of the Engineers' case. Journal of Industrial Relations. 6, pp. 61-66.

On salary and employment conditions the I.E.Aust. prefers the A.P.E.A. to act as spokesman, leaving the I.E. to devote its attention to acting as a spokesman on matters of status and education.

AN ACCREDITING OR QUALIFYING BODY

It is in the interest of educational bodies that provide engineering courses to provide courses that will lead to the award of a qualification that will give the holder professional status. In determining whether a qualification is satisfactory for admitting the holder to the profession, the I.E.Aust. plays a significant role as an accrediting body. The power of assessing standards of theoretical knowledge required for admission is granted by the Royal Charter.[85] The 1961 Conciliation and Arbitration Award for professional engineers named the I.E. as the qualifying body for engineers in Australia.[86]

There appears to be no doubt in its own mind, nor any in the mind of the industrial court that the Institution of Engineers, Australia is a regulatory

---

85. Royal Charter. para. 4b.

86. Moorhouse. 1964. loc.cit., Corbett. loc.cit.; Encel. 1964. op. cit.

body, and as such, plays an important role in the educational process.

In 1967 the I.E.Aust. gave notice[87] that from 30 June 1980 "The Institution will not accept for admission to the Grade of Graduate or of Member a qualification obtained after that date unless it meets the following requirements:

1. A course must be of not less than four years duration for a full time course after a standard of secondary education not less than the general standard of examination for matriculation to an Australian university;
2. A part-time course must be of sufficient duration to attain a similar standard as a four year full time course after a similar standard of secondary education".

(See Appendix C for a reproduction in full of this statement).

The Institution has also published a document entitled "Conditions for Accreditation of Courses" in which it says that in order to be accredited the course should meet Institution requirements. "Should

---

87. Journal I.E.Aust. 1967. 39, p.N10.

any course be considered not to comply with the Institution's requirements, the course will be placed in the 'provisional' category and the apparent short-comings will be indicated with a time limit set for their rectification. Failure to comply with the indicated requirements within the time specified, may result in withdrawal of accreditation of a course or the educational establishment at which it is conducted". (See Appendix E for reproduction in full of this document).

An educational body wishing to have a course accredited must complete a long and detailed questionnaire answering questions on

1. Course identification,
2. Entry qualifications,
3. Course arrangements,
4. Curriculum,
5. Examination procedures,
6. Academic staff,
7. Laboratories and workshops,
8. Computing facilities,
9. Library,
10. Student statistics,
11. Experience requirements.

(See Appendix G for reproduction in full of this questionnaire).

From time to time the Institution publishes a list of accredited courses and also those in the "provisional" category. (See Appendix H for a reproduction of the latest list).

Membership of an Institution of Engineers has always been highly regarded. C.E. Moorhouse cites an example of an engineer, late in the 19th century who arrived in Australia from England to find academics at the University of Melbourne much more impressed with his membership of the Institution of Civil Engineers than they were with his extremely high academic qualifications.[88] Respect for Institution membership status was reflected in handbooks and course outlines. In 1911 the Calendar of the University of Melbourne said "Candidates are recommended to comply with the present Regulations which conform closely to the requirements of the entrance examination of the Institution of Civil Engineers".[89] Most CAE handbooks

---

88. Moorhouse. 1964. op.cit., p.246.
89. Quoted in ibid.

and Calendars in the 1970s list courses which are accorded I.E. recognition.[90]

Although documents relating to acceptance, rejection and modification of courses suggested by the Institution are confidential, careful perusal of annual reports and reports of Council meetings will give one an indication of the activities of the Institution in this regard. The twelfth annual report discusses the Institution's view that "the control of technical education should be in the hands of those in direct contact with industry".[91] The reason for a discussion of this nature arose out of suggestions for the change in the system of technical education. The fourteenth annual report describes a successful I.E.Aust. delegation to the Minister for Education in N.S.W. to institute an inquiry on standards and new courses at the Sydney Technical College.[92]

---

90. See for example N.S.W.I.T. Calendar. 1972. pp. 155, 178, 164, 183, 209; Swinburne College of Technology Diploma Schools Handbook. 1971. p. 54; South Australian Institute of Technology Prospectus. 1973. pp.41-46.

91. <u>Journal I.E.Aust</u>. 1932. 4, p.178.

92. <u>Journal I.E.Aust</u>. 1934. 6, p.122.

Over time, there had been suggestions from academics that entry standards were too low.[93] This generated some correspondence which suggested that if entry standards were in fact low, the Institution should increase its supervisory role to ensure satisfactory high school teaching of mathematics and science.[94]

A Board of Examiners was, however, set up (set up initially as a Committee of Examiners) and from 1922 "was beginning to influence the revision of engineering courses and the adoption of defined standards of admission to diploma courses".[95] There were very few changes in standards over the next 20 years until the 1946 annual report expressed concern at the declining entry standard and recommended the setting up of an Engineering Education Standing Committee of the Council in 1947.[96]

---

93. Professor A. Burstall. 1941. Journal I.E.Aust. 13, p.148; Professor Hawken. 1943. Journal I.E.Aust. 15, p.120. See also Journal I.E. Aust. 1938. 10, p.273; Journal I.E.Aust. 1938. 10, p.307.

94. Journal I.E.Aust. 1943. 15, pp. 233-4.
95. Corbett. loc.cit.
96. ibid., pp. 145-6.

This proposal was made to the Council by the Board of Examiners which was showing a considerable amount of activity. It reported in July 1947 that many qualifications giving exemption should no longer do so.[97] The criterion of measurement was the number of class contact hours. A unit was 100 hours of theoretical training or 200 hours of practical work, and it was resolved "that all technical colleges be asked to work towards the adoption of a standard of 15 units of instruction for a full time engineering course and 12.5 units for a part time course". (This was adopted by Council on 23.11.1948.)[98]

A further resolution (adopted by Council 23.11.1948) was

> that Council affirm that the primary objective of the Institution in its present survey of educational institutions is to fix some suitable standard of examination qualification and to endeavour by negotiation to ensure that the standard of each college shall, if necessary, be raised within a reasonable time to conform to the Institution's standard. 99

It is of interest to note that these conditions and statements were relevant only to the colleges and

---

97. Journal I.E.Aust., 1949. 21, pp. 58-9.
98. ibid.
99. ibid.

not the universities. Since then, the Institution has claimed it has played a significant role in the development of engineering education at all levels.

At the 149th meeting of Council (1957) concern was expressed at the shortage of scientists and engineers, and a recommendation made that the (Commonwealth) Government set up a committee to investigate.[100] Shortly thereafter the Murray Committee[101] was set up and the Council resolved to make its views known to the Committee.[102] (No judgement is being made here on the influence of the I.E.Aust. in having the Murray Committee established.)

The Institution began to examine certain courses in some depth, and Council reports give an indication of the Institution's attitude. In 1958 it notified Local Government examiners that they should improve their standards or recognition would be withdrawn.[103] In 1959 it rejected a proposed Royal

100. Journal I.E.Aust. 1957. 29, p.26.
101. Murray Report. op.cit.
102. Journal I.E.Aust. 1957. 29, p.199.
103. 154th meeting of Council. Journal I.E.Aust. 1958. 30, p.243.

Melbourne Institute of Technology Correspondence Course.[104] In 1964, realizing that Institutes of Technology were to be established in N.S.W. and Western Australia, Council ordered an investigation by the Board of Examiners so that an Institution policy could be devised regarding these bodies.[105]

In 1957 it made a long statement announcing that in future, except in exceptional circumstances, qualifications would not be available as a result of I.E. examinations.[106] It appeared, at the time to have non-university courses very closely scrutinized. Late in 1957 a policy statement was made by the Council:

> The I.E.Aust., being the recognized professional body and having a responsibility to maintain professional standards has the two-fold task of determining the educational levels which must be attained as a preliminary to professional recognition, and of ensuring that these levels should be capable of variation to meet the changing needs of the profession. Educational levels are maintained with the aid of academic precedents; it is important that precedent should not be

---

104. 160th meeting of Council. Journal I.E.Aust. 1961. 32, p.N11.

105. 178th meeting of Council. Journal I.E.Aust. 1964. 36, p.N53.

106. Journal I.E.Aust. 1957. 29, p.162.

> allowed to restrict flexibility. ... A sound engineering course has two essential aspects, breadth and depth. 107

The statement concluded with a comment that well established university courses are good guides upon which to model proposed college courses.[108]

It would appear that this 1958 statement respected university standards and the traditional concept of university autonomy. Notwithstanding this, in the following year a course at the University of N.S.W. was withdrawn to comply with I.E. interests.

Professor J.F.D. Wood, a member of the Council of the University of N.S.W. and of the Board of Examiners, I.E.Aust. wrote in 1965 of the decision of the Council of the University of New South Wales in 1959 to withdraw the award of the A.S.T.C.* in favour of a six-year part-time B.Sc.(Tech.). It was decided that the seven-year part-time B.E. course be withdrawn.[109] Wood claimed that one major reason for

---

* Associate of Sydney Technical College (an award granted by the then N.S.W. University of Technology).

107. Journal I.E.Aust. 1958. 30, p.65.
108. ibid.
109. J.F.D. Wood. 1965. Technical and technological education - N.S.W. In E.L. Wheelwright. op.cit., p.195.

replacing the A.S.T.C. with the B.Sc.(Tech.) "was the need to maintain professional recognition". The I.E.Aust. was not happy with the amount of time allocated to the basic sciences, particularly Physics, in the A.S.T.C. The new courses were designed with this criticism in mind.[110]

In an attempt to increase the status of engineers, the Institution announced in 1967 that from June 30, 1980 it will recognize only those courses which run for four years full time (or the part-time equivalent) following the completion of satisfactory secondary education (see above p.226 and also Appendix C). In an editorial in the June 1972 issue of the I.E.Aust. journal[111] it was claimed that sufficient notice was given to the educational authorities for them to have made satisfactory plans. Clearly the move was an attempt to exclude from the profession people who have completed "low status"courses and also to standardize entry requirements.

The pronouncement, said the editorial, creates a problem. "The future of the three year Diploma

---

110. ibid.

111. Journal I.E.Aust. 1972. 44(7-8), p.23.

of the Colleges of Advanced Education has become a difficult problem for the administrators to solve." The editorial suggested that one solution would be for the smaller CAEs to discontinue the education at this stage (emphasis in original) of professional engineers. If this occurred, there would be fewer CAEs competing for the available funds.

The editorial concluded by pointing to the fact that there is no desperate shortage of professional engineers, but a shortage of highly trained technicians. "It is therefore suggested that all current Diploma courses which are recognized by the Institution, should not necessarily be converted to the demanding four-year degree courses." The editorial, not unexpectedly, brought a sharp reaction from CAE academics. The writers of the letters of reply pointed out that the Commonwealth Government was unlikely to support (in fact the Australian Commission on Advanced Education had rejected) proposals to increase the length of courses to four years.[112]

The Institution of Engineers, Australia, acting

---

112. *ibid.*; and *Journal I.E.Aust.* 44(10-11), pp. 17-18. Dr. C. Selby-Smith of the A.N.U. has examined the issue of lengthening courses to 4 years. See A.C.A.E. Report. *op.cit.*, p.129.

as an accrediting body can virtually condemn a small CAE to educational oblivion. More important, by deciding accreditation criteria it can manipulate and direct the whole system of engineering education. The countervailing power of the supposedly autonomous educational bodies makes this an interesting political situation.

While the decision of the Institution will have a profound effect on some CAEs, one interesting development has been the effect the decision has had on the largest engineering school in the country - the Faculty of Engineering at the University of New South Wales.

The policy of the Council of the University of N.S.W. has been to support part-time courses wherever possible in Science, Applied Science and Engineering. In Engineering, the part-time course is of six years duration. Students attempting the six year part-time course must have <u>concurrent approved</u> employment. It is claimed that if the student spends several years employed in an engineering office he will master some of the rudimentary skills required. These are included in the full time course, but not in the part-time course. For this reason the part-time course is only of six years duration, compared with the full time course of four years.

The I.E.Aust. has informed the University that the six year part-time course will not, after 1980, qualify the graduate for membership. Interviews with academics in the Faculty (see below) revealed considerable hostility towards the I.E. as a result of this action. Some academics however, were not hostile, and accepted that the I.E. had the right to do as it pleased. Some were anticipating a battle, others were not, but nearly all conceded that they thought that the I.E. would win out and that the six year course would not be continued in its present form.

The Professorial Board (with resolution No. 72/305) appointed an _ad hoc_ committee "to consider the future of part-time courses recognized by the Institution of Engineers, Australia". This was a particularly high-powered committee and consisted of the Chairman of the Faculty of Engineering, the Dean of the Faculty, one Pro-Vice-Chancellor, five other engineering professors (three of whom were heads of Engineering Schools) and one Associate professor. The high-powered _ad hoc_ committee reported back to the Professorial Board late in 1972.

Its report showed that it was completely acquiescent to the I.E. demands. One professor recommended the abandonment of a complete part-time course and its replacement by a course that combined full time and part-time study. Another expressed the view that "the University should challenge the attitude of the Institution, with its implied disregard for the value of the experience inherent in part-time courses". Apart from this weak challenge, the minutes reveal that the committee felt it had no option but to accept I.E. policy as it affected their courses.

The concluding section of the minutes reads as follows:

> The Committee debated at length the implications of the possible withdrawal of recognition, agreeing that early advice to students was essential. Consideration was also given to the economics of continuing to provide evening courses for small numbers of students and in this regard it was suggested that Council should be invited to review its policy concerning part-time courses which might not be accorded professional recognition.
>
> After further detailed discussion, the Committee RESOLVED:
>
> (1) The sub-committee believes that it would be undesirable to offer courses that do not allow graduates to attain Corporate Membership of their professional body.

(2) In the event of the B.Sc.(Eng.) and B.Sc. (Tech.) courses not being recognised in their present form by The Institution of Engineers, Australia after 30th June 1980, the Committee recommends that all B.Sc. (Eng.) and B.Sc.(Tech.) courses now offered be progressively discontinued after 1973. It is proposed that students entering the current B.Sc.(Eng.) and B.Sc.(Tech.) courses in 1973 be permitted to complete them.

(3) The Committee recommends that the Professorial Board ask the faculties offering such courses to consider alternative means of obtaining a qualification which will be professionally recognised, with due regard being given to The Institution's requirement that students in six-year part-time courses should have the equivalent of not less than one day per week of daytime release. It is further recommended that Council be informed of the following requirements of The Institution concerning course duration:-

(a) A course must be of not less than four years' duration for a full-time course after a standard of secondary education not less than the general standard of examination for matriculation to an Australian University.

(b) A part-time course must be of sufficient duration to attain a similar standard as a four year full-time course, after a similar standard of secondary education.

(4) The Committee requests the Board to draw the attention of Council to these proposals and to suggest that Council consider the implications in relation to its policy concerning part-time courses.

(5) The Committee recommends that the attached statement to students be approved by the Professorial Board and be sent by the Registrar to all students undertaking courses affected by The Institution's policy.

ATTACHED STATEMENT TO STUDENTS

RECOGNITION OF DEGREES BY THE INSTITUTION OF ENGINEERS, AUSTRALIA

Students working for the degrees of B.Sc. (Eng.) and B.Sc. (Tech.) are advised that the Institution of Engineers, Australia proposes that after June 30th 1980 it will accept for admission only those qualifications obtained after that date which meet the following requirements:-

(1) A course must be of not less than four years' duration for a full-time course after a standard of secondary education not less than the general standard of examination for matriculation to an Australian university.

(2) A part-time course must be of sufficient duration to attain a similar standard as a four-year full-time course, after a similar standard of secondary education.

(Students in six-year part-time courses should have the equivalent of not less than one day per week of daytime release).

Thus, a student enrolling in Stage I for the first time in 1975 and proceeding wholly by part-time study will be affected by the new policy. Students in Stage I in 1973 and 1974 may be affected if they take more than the minimum time to complete the B.Sc. (Eng.) or B.Sc.(Tech.) degree.

Students are reminded that completion of these degrees can be accelerated by a combination of full-time and part-time attendance and are encouraged to seek additional day release for this purpose.

Students are asked to advise their industrial training officers and employers of the above.

At the time of writing the matter had not been fully resolved, but this is not important here. The point to be noted, however, is the apparent helplessness of the _ad hoc_ committee of the Professorial Board of the University of New South Wales in the face of I.E. opposition. This episode has certainly demonstrated the interest, and the power of the Institution of Engineers, Australia.

An interesting sideline is that there appears to be no real agreement on the length of engineering courses. In the June 1972 issue of the _Journal of the I.E.Aust._ two long letters relating to the length of courses appeared alongside one another (pp. 23 and 24). Both were written by prominent professors of engineering, and both argued that the four year full time course was not ideal. One argued that courses should be extended to five years, the other that courses should be reduced to three years!

VIEWS ON THE ROLE OF THE I.E.AUST.

Chapter VIII below deals with some contemporary attitudes towards the I.E.Aust., and impressions of the extent to which the I.E. influences current courses. Statements made by the I.E. and by academics over time are presented to further increase understanding of the body and its perceived relationship with the academic institutions.

In 1933 Sir Henry Barraclough, Dean of Engineering, University of Sydney, and later President, I.E. Aust. spoke about the necessity of a close relationship between the University of Sydney and the I.E. "The University endeavours to meet the developing needs for such courses of training for the professions [engineering] while adhering to its fundamental standards and ideals of scholarship, yet recognizes and accepts certain limitations involved in the unique authority granted to it. In these matters a sympathetic and close relationship between the great professional Institutions and the University is of vital importance".[113]

In 1936 F.G.A. Sublet, a corporate member of the I.E.Aust. said that the I.E. as a central, federal body should co-ordinate engineering education in all States and at all levels.[114] Sublet however, felt

---

113. Sir Henry Barraclough. 1933. The engineering School in retrospect. Journal I.E.Aust. 5, p.309.
114. Sublet. op.cit., p.134.

that the bond between the Institutions and the universities in Britain were not strong enough[115] and that in Australia the I.E.Aust. had not exerted a sufficient amount of control over courses - "The Institution as a whole has done very little towards ensuring that the teaching institutions have suitably modified and extended their programmes so as to ensure the adequate training of future members of the profession".[116] In 1946 the I.E.Aust. President, T.H. Upton said, "I feel we should, as an Institution develop clear and definite views [on] engineering education, so that we might play as influential a part in this as do the major engineering Institutions in the U.K."[117]

Professor Lavery, Professor of Civil Engineering, University of Queensland, in discussing the main factors influencing the character of Civil Engineering courses in the University of Queensland listed (among other things) "the degree of co-operation with

---

115. *ibid.*, p.126.
116. *ibid.*, p.131.
117. Quoted in Corbett. *op.cit.*, p.145.

professional engineering institutions and practicing engineers".[118] He went on to say that the university seeks to be closely associated with the profession and that courses have been designed to consider the interests of (among others), the professional institutions.[119]

In 1965 Professor Wood wrote of the withdrawal, at the University of N.S.W., of two courses to ensure continuation of I.E. recognition (see above, p. 234).

Stewart Armstrong, Head of Engineering at the South Australian Institute of Technology, wrote in 1966 "The Institution of Engineers, Australia does not seek to dictate course or syllabus content, but it does require that any course of training in engineering which is to be recognized by the Institution should have a broad base of science subjects and should also have a major specialization studied in depth and with an analytical treatment".[120]

---

118. J.A. Lavery. 1964. Engineering courses in Australian universities - civil engineering. The Australian University. 2, p.283.

119. ibid., p. 290. et.seq.

120. S. Armstrong. 1966. Technical education and the professions. In C. Sanders (Ed.). op.cit., p.222.

In a symposium at the University of N.S.W. in 1966, Professor C.E. Moorhouse, Dean of the Faculty of Engineering, University of Melbourne, and Chairman, Board of Examiners, I.E.Aust., stated "It is essential for the well-being of the universities as well as of professions, for members of university staffs to be acceptable to these bodies and to take an active interest in their affairs".[121]

In 1969 the President of the Institution, I. Langlands said "The Institution does not believe that professional societies should draw up syllabuses ... as it considers that they [educational authorities] should be free to arrange their own courses and to amend them from time to time ... However, courses submitted for recognition must satisfy the specified requirements as to breadth and depth. In considering submissions the Institution takes into account not only the syllabus but also other factors such as the size and quality of the teaching staff, and the standard of laboratory equipment. Approved courses

---

121. C.E. Moorhouse. 1966. Undergraduate courses. University of N.S.W. Symposium on the Role of the University in Preparation for the Professions. Kensington. p.23.

are reviewed at regular intervals".[122]

In his Presidential Address to the Institution in 1970, Professor J.W. Roderick, Dean of the Faculty of Engineering, University of Sydney said "While education is a matter for the universities and colleges, training is rightly a task for the profession itself". Before granting corporate membership, the Institution satisfies itself that an approved course has been taken, followed by a period of approved practical training.[123]

Professor D. Campbell-Allen, Professor of Civil Engineering, University of Sydney, and Chairman, Sydney Division, I.E.Aust., wrote in 1969 of the strong links between the Institution and the university. "The Institution is in the strong position of regulating the standards of education and experience which it considers necessary for a qualified engineer. In other professions, a State board may have the last say in such matters, but in engineering the last say has been left with the Institution. Its Board of Examiners is continually reviewing courses being

---

122. Langlands. <u>op</u>.<u>cit</u>., p.138.
123. Roderick. <u>op</u>.<u>cit</u>., p.19.

offered at educational centres to ensure that the course context, the teaching facilities and most importantly the staff, are of adequate standing".[124] (It is of interest to note that this was written for an engineering undergraduate yearbook.)

Regardless of the desirability of the professional body influencing the academic institution the position appears to be one of considerable influence of the I.E. Since 1922 the Board of Examiners has been involved in communicating with colleges and universities, and reviewing standards. It is in the interest of the educational body to have their students gain an accepted and recognized qualification, and on the surface, a close and harmonious relationship between the educational body and the I.E.Aust. seems to suit both.

DISCUSSION

That the I.E.Aust. seeks to influence course determination in the universities and colleges cannot be disputed. The extent to which this is successful

---

124. Campbell-Allen. op.cit., p.73.

is discussed below. It is done both manifestly, by issuing documents such as those reproduced in Appendices C, D, E, F, G and H and latently, by continually stressing the importance of maintaining, and even increasing the status of the professional. Education however, is seen as the key to an increase in status.

Ideally one thinks of tertiary educational institutions as autonomous bodies. If the professional institutions are in a position to dictate, or even influence courses then the concept of autonomy must be re-evaluated.

It can be argued that engineering courses are practical and community oriented, rather than purely theoretical and campus oriented, and as a result, those who are to be affected by the qualities and abilities of graduates should have some say in engineers' training. This is the argument of those who subscribe to a view that "autonomy would be a mistake".

The "autonomy must be preserved" supporters point to the sentiment expressed in the 1963 Royal Commission on Higher Education in Quebec. The

Commission stated that clearly regulated professional influences are "restrictive and even menacing to the growth and well being of higher education".[125]

If one were to examine the role of academics in this situation a different model of autonomy can be built up. Some academics certainly wear two hats - one as an engineering professor, and the other as a member of the Institution. In 1919 when the I.E.Aust. was founded, academics played a prominent role.[126] Today they still do. Several sit on the Council and several more sit on Committees such as the Qualifications for Membership Committee, the Board of Examiners, The Technical Standing Committee, Foreign Qualifications Advisory Sub-Committee, The Papers and Publications Committee, The Joint Library Committee, The Code of Ethics Committee, and all of the specific discipline Technical Committees have a number of academics among the members. Professor A.H. Willis believes that "engineering education should be the concern of the entire profession, not merely its academic members".[127] Academics sit on many important

125. Quoted in Venables. op.cit., p.60.
126. Moorhouse. 1964. op.cit., p.247.
127. A.H. Willis. 1963. The unsteady state of engineering education. Journal I.E.Aust. 35, p.62.

I.E.Aust. committees, and, it appears, dominate the educational ones. In fact, in their role as Institution members they are bringing pressure to bear on themselves as academics. Lord Bowden says that an intolerable autonomy crisis situation is avoided by the dual roles of key personalities.[128]

Ideally, says A.H. Halsey, any educational body involved with professional education is concerned with two things:[129]

(a) promotion of expertise,

(b) professional socialization.

It is of interest to note that several writers claim that the most important aspect of professional education is professional socialization - acquiring the right sorts of values, and accepting the professional sub-culture. Any gaps in practical or academic knowledge can be learnt later, during the practice of the profession.[130] That university and college courses leave gaps in inevitable. The Council of the

---

128. Lord Bowden. 1966. The professional society. Universities Quarterly. 20, p.152.

129. A.H. Halsey. 1966. The disciplines of professional study. Universities Quarterly. 20, p.191.

130. Jencks and Riesman. op.cit., pp. 205-6. Bowden. loc.cit.

I.E.Aust. stated in 1932 "The function of an engineering education is not to produce an engineer, but to produce a man who will rapidly become a high-class engineer when given the necessary experience".[131]

If it can be argued that the universities teach only a smattering of the subjects, but inculcate professional values, then for one to learn adequately during one's post-graduate experience, one's attitude will be of vital importance. Here the role of the I.E.Aust. as a learned society is important. Thus, it could be argued, in the long run, engineers have the right values[132] (inculcated at university and during immediate post-graduate experience) and a satisfactory amount of knowledge. (The I.E.Aust. learned society function building on an adequate university foundation can be used as an explanation here.)

Of course this proposition can be argued in reverse (the university provides the knowledge - the

---

131. Journal I.E.Aust. 1932. 4, p.356; See also 13th Annual Report of the I.E.Aust. Journal I.E.Aust. 1933. 5, p.169.

132. It is of value to consult the studies on professional socialization undertaken by D.S. Anderson and J.S. Western (see bibliography).

I.E.Aust. the values!) Until there is adequate substantiation the proposition is purely speculative.

SUMMARY

It is apparent from the published statements and documents of the Institution of Engineers that it is concerned with:

(a) achieving a high, exclusive status for its members. This it attempts to attain by controlling entry to the profession, and by specifying a clear demarcation line between the professional, and the "sub-professional";

(b) fostering a professional ethos.

To ensure high status, the I.E. attempts to ensure that acceptable university and college courses are <u>long</u> and <u>hard</u>. Entry to the I.E. is almost exclusively achieved through an exempting qualification (a degree or diploma) and no longer through its own examinations. This reaffirms its powerful, but informal accrediting role. This is backed up by the industrial court's definition of a professional engineer as one who is eligible for I.E. membership.

The Institution acts as an agency of professional socialization and encourages academics, and aspiring professionals to join the body. Student membership is encouraged and it is very cheap. The student receives the journal and is made to feel he belongs to an important social/professional entity. As most engineering academics are I.E. members it is anticipated that professional socialization is a latent function of an engineering course.

The Institution of Engineers, Australia, then, has a set of interests. These interests can be thought of in terms of pressures that are brought to bear on the educational institutions. They are important in determining curricula. They are non-academic pressures.

CHAPTER VIII

INTERESTS AND ACTIONS OF INDUSTRY

INTRODUCTION

The Commonwealth Advisory Committee on Advanced Education used the term "industry" as "a convenient short term to cover primary and manufacturing industry, commerce, government and community service."[1] Approximately 93% of Australia's engineers are "in industry". The remainder are in education (5.4%) and the armed forces (1.8%).[2] As the content of professional engineering courses is of great interest to industry, it could be hypothesized that the interests of industry are presented to the policy makers in the educational bodies in the hope that the courses decided upon will be suitable for future workers in the industrial complex. The task in this chapter is to discover whether interests are transmitted, and if so, the channels and styles of interest articulation.

---

1. Second C.A.C.A.E. Report. op.cit., p.3.
2. Department of Labour and National Service Survey. Journal I.E.Aust. 1972. 44 (7-8), Table 3, p.21.

In examining the extent to which interests of industry are factors which help determine course structure and content, questions relating to academic freedom will recur. It could be very strongly argued that it is in the interest of industry to preserve the socio-industrial status quo, and if vigourously preserved, there may be a limit on the objective freedom of academic policy makers.

It has been shown above (Chapter VI) that Government and its advisers have expressed strong feelings on the desirability of close contacts between educational bodies and industry. In both universities and CAEs, but particularly in CAEs, Government has encouraged more direction from industry regarding courses that are provided. Both the University of N.S.W. and the N.S.W.I.T. encourage close liason with industry, mostly through their Visiting and Advisory Committees, but also through academics engaging in research (university) or dealing with students and their employers in sandwich courses (N.S.W.I.T.). Academics in both institutions engage in some consulting work for industry.

It has been stated above that Australian education is regarded as particularly utilitarian, that tertiary education is seen as an economic investment, and that universities and colleges are being expected to conform to someone's conception of the public interest (above, Chapter II). This "someone" is an amorphous mass of Government, industry, and "the community". An attempt has been made above to describe "Government's" interest in engineering education. It will be much more difficult to describe "industry's" interest, for "industry" is by no means a unified entity. To describe "the community's" interest would be so general that it would be meaningless - the relevant aspects of the community's interest are discussed with the interests of Government and "industry".

Although "industry" is by no means a unified entity, one often hears that courses must be designed to be satisfactory for "industry". Although "industry" is not united, there is a recognition that there is such a thing as "industry" and that "it" has certain rights, and certain obligations.

OPINIONS OF ENGINEERS IN INDUSTRY

In an attempt to ascertain the interests of industry, three sources are used:

1. Published statements and opinions of industrialists and academics relating to "universities and industry" and "colleges and industry";
2. Interviews with very senior engineers in industry;
3. Responses to a questionnaire.

These three sources are used to examine the key issues of industry's attitudes towards: the training process and specialization; industry and the universities and colleges; the I.E.Aust.; the levels of engineering education; and some questions of status.

THE SAMPLES

Long and detailed interviews were carried out with twelve senior engineers in industry. They were men who were quite familiar with current practice in engineering education. The interviews lasted from one to two hours, and the respondents were very keen and co-operative. All were prominent in the

Institution of Engineers (they were members of the Institution's Qualifications for Membership Committee - a committee which assesses the industrial experience of applicants for corporate membership of the I.E. Aust.), and all were prominent in their employment position e.g. they were chief engineers of large private corporations, or of substantial government departments or statuory authorities.

A questionnaire was sent to a sample of 373 engineers in industry (the questionnaire is reproduced in Appendix A). All 373 were corporate members of the Institution of Engineers, Australia, and all resided in the Sydney metropolitan area. Their names were selected at random from the Directory of the I.E. Aust. (Academics were excluded.)

153 or 41% responded. This low response can be attributed to the fact that the questionnaire was completely unsolicited and there was no real incentive to reply. There was only one contact - a communication which contained only the questionnaire and a covering letter. There was no follow-up at all. Furthermore, in the five years prior to the administration of the questionnaire, the then Department of

Labour and National Service had carried out two surveys - both involving long questionnaires - of engineers who would undoubtedly have been included in this questionnaire. The present questionnaire was sent out to discern whether there was a range of opinion on certain matters of engineering education, but because of the low response rate any conclusions to be drawn must be regarded as tentative.

Of the respondents 87 (57%) were university graduates, 57 (38%) were diplomates and 9 (6%) were "other". (The position in Australia is: graduates - 51%; diplomates - 44%; "other" - 5%). 31 (20%) of the respondents were self-employed, 58 (38%) were employed in private industry and 64 (42%) were government employed. Retired engineers (8) were included under their former employment status. (The position in Australia is: government employed - 54%; self and privated employed - 46%).

Of those in private industry, 58% were university graduates. Of those in government employment 52% were university graduates. The respondents in private industry were slightly younger than those in government employment.

In contrast to the interviewees, the questionnaire respondents showed considerable differences in attitude towards university and colleges, and further, a large number checked the "not sure" box on many items, an indication perhaps, that they were not really aware of, nor felt able to speak on, the present situation in engineering education. The questionnaire covered an area similar to that covered by the interviews and thus a range of (educational) interests of leading industrial engineers as well as those of a large sample of engineers in industry was sought. In addition attitudes towards universities and CAEs were sought in an attempt to discover levels of satisfaction with the various educational bodies, and the extent to which engineers believe their interests can and do affect courses.

TRAINING AND SPECIALIZATION

All of the interviewees said that the standard of engineering education in the universities is generally adequate. There was some concern that universities "overtrained" their graduates i.e. taught at too abstract and theoretical a level. Two distinct viewpoints were expressed, however, as to broad objectives.

(i) Those who saw the universities as instilling broad principles upon which industry later builds. Industry thus trains (or retrains) the graduates.

> "Industry retrains graduates to suit its own needs - and these vary. Universities can't be expected to put up courses to supply individual company needs."

> "I don't subscribe to the view that a university graduate should enter his profession and be useful immediately - this is rot - you go to the technical college if you want someone who is immediately useful."

(ii) Some claimed that graduates come out full of useless knowledge that has no application to industry.

> "It is inconceivable that somebody can come out of a university course and not be able to design something as simple as a sewer."

> "Graduates want to design harbour bridges the minute they graduate - there's too much glamor stuff being taught."

The object of engineering education, all agreed, is to produce a capable graduate who can come to grips with all sorts of problems, both technological and managerial.

The interviewees all saw practical training during the undergraduate period as essential.

Generally the quality of professional engineering education in Australia was praised. All Australian universities were seen to be turning out a satisfactory and acceptable product.

In the questionnaire sample, 15% agreed that university trained engineers were overtrained, 67% disagreed (14% "strongly"), and 18% were "not sure". Of the graduates who answered this question, 10% agreed, 74% disagreed, and 16% were "not sure". Among diplomates on the other hand, 24% agreed and 53% disagreed, while 23% were "not sure".

Although there was consensus that university graduates were not overtrained, a sizeable number did not agree. If this latter group were to grow in number, it could be important in considering the objective freedom of universities, especially the extent to which they (the universities) might be expected to conform to more utilitarian views of engineering education.

The major warning in the interviews concerned over-specialization. Most respondents preferred a Bachelor of Engineering degree in which broad principles are taught. A post-graduate diploma could be taken to gain the necessary specialization. In the interviews, these employers showed they had quite firm ideas about the sort of graduate they would like to see. (In addition to special skills, they spoke of desirable qualities engineering students should possess, and of professional socialization generally.)

All of the interviewees said they would be just as happy to employ a CAE diplomate or graduate, as they would a university graduate. They claimed that although there might be small differences (especially in practical orientation) shortly after graduation, after a few years the college diplomate/graduate and the university graduate were indistinguishable.

> "CAE graduates are much better practical men at first - university graduates are too theoretical."

Some saw a different role for the CAEs.

> "CAEs should not duplicate what universities do. There is a need in industry for people who will not be working in the more sophisticated fields, but still require a high level of knowledge."

Statements such as the last one led to discussions of the status of engineers. About half stated that they felt that the status was declining, while the other half felt it was rising, but this was not related to the two tier educational system. All stressed very firmly that clear lines of demarcation should be drawn between the professional and the sub-professional. Even though they saw a shortage of engineers in Australia,* all stressed that standards must not be lowered in order to raise the number of engineers, no matter how desperately short industry might be.

A small, high status profession appeared preferable to a larger, lower status one. This could be maintained, the interviewees reported, through the educational bodies continuing in the present manner. Other than express an opinion that this was desirable, there did not appear to be any tangible influence they felt they could bring to bear.

INDUSTRY AND THE UNIVERSITIES AND COLLEGES

Almost all of the interviewees stated that relations between industry and the universities and

---

* The position has changed somewhat in the last two years.

colleges could be improved. Basically this meant that there wasn't <u>enough</u> contact or interaction. They stressed that academic autonomy was vital, and in their opinion existed, but often added a rider that there should be more interaction (and hence, more notice taken of industry's views).

> "Current academic training is satisfactory. A technologically competent graduate is turned out. The views of industry must be taken into account in university activities."

> "The lecturing in universities is poor. They [lecturers] just plod on from lecture to lecture. They don't know what's going on in industry. In many ways industry is far ahead of universities, but people in universities just don't know nor are they prepared to find out. For instance they teach digital techniques, but how many lecturers know where they are being used, and how?"

There were reservations about the Visiting Committees - about half felt they were not particularly useful.

> "Industry has no say at all in the advisory committees, and anyway, the advisory committees are only advisory."

The other half said that they were reasonably useful, but certainly not a source of conflict.

> "Universities listen to advisory committees, but as there's no trouble with the content of courses, there's no conflict."

One area where one might expect considerable (if latent) pressure was through sponsorship of research. While some interviewees agreed that the sponsorship of research was desirable and should be continued, they were adamant that this did not give them any extra rights regarding determination of academic programmes.

As will be shown in greater detail below, what contact there is, is largely informal.

> "I know quite a few professors. As well as on the advisory committee we meet through the Institution and sometimes socially."

Nearly all (over 97%) of the questionnaire respondents agreed that "views of industry should be considered in planning ... engineering courses." They stated more emphatically that views of industry should be considered more in CAE courses than in university courses. For universities 36% marked "strongly agree" and 58% "agree", while for CAEs 54% marked "strongly agree" and 45% "agree". The response to these items could be used as evidence to show that many engineers in industry expect more industrially oriented course work to be taught in CAEs than in the universities.

A difference became evident over whether universities and colleges were seen as willing to listen to industry's criticism of courses. Very few of the questionnaire respondents saw the educational bodies as aloof and unwilling to consider industry's interests, although colleges appeared more agreeable than universities. 25% of the respondents thought that universities were willing to listen to criticism, 12% thought not, and 63% were not sure. With regard to the colleges, 41% thought that colleges were willing to listen to criticism, 4% thought not, and 55% were not sure. More graduates than diplomates thought that universities were willing to consider criticism (31% and 19% respectively). More diplomates than graduates thought that colleges were willing to consider criticism (56% and 31% respectively).

Fewer, however, agreed that <u>at present</u>, views of industry were being adequately considered in university and college courses: for university, 10% agreed, 39% disagreed, while 51% were not sure. As with the previous pair of items, more graduates than diplomates thought that universities were adequately considering industrial views, while more diplomates than graduates thought that colleges were adequately considering industry's views.

There is a situation, then, in which

(a) Nearly all respondents said views of industry should be considered in planning engineering courses;

(b) Most respondents said either that the universities and colleges were willing to listen to industry's criticism, or were not sure (very few said they were unwilling; but

(c) Very few thought that at present, views of industry were being adequately considered in university and college engineering courses.

Does this mean that those in the universities and colleges are asserting their autonomy - giving the impression that they are prepared to listen to industry's criticism, but in fact not taking it into account in determining courses? Such a conclusion could be drawn on the basis of the evidence above. This gives weight to the argument that two different sorts of power exist within the universities and colleges - the power of the governing bodies, and that of the academics.

Representatives of industry sit on university and college councils and there are visiting and advisory committees, and these bodies are not unwilling to listen to industry's criticism. The academics, however, organize course details largely as they please. It was shown in Chapter V that the head of a school has considerable informal power, and it will be shown below that informal approaches from industry to individual academics are used more than formal approaches to the educational bodies. This has interesting implications for the understanding of the notions of objective and subjective freedom.

STYLES AND CHANNELS OF ARTICULATION

Item 9 of the questionnaire, which asked "If you are not satisfied with an engineering course presently being offered by a university, is there any action you could take?", drew a response as follows: "yes 43% (N = 66), "no" 46% (N = 70), no reply 11% (N = 17). If those that did not reply are excluded, then 48.6% felt "efficacious" in this regard and 51.4% did not. [In this text, those who answered "yes" to item 9 will be described as "efficacious" and those who answered "no" as "non-efficacious".] To have almost one half say that there is some course of action they could take raises a number of interesting questions about non-academic influences on academically autonomous educational institutions.

The 66 individuals who answered "yes" to item 9 listed a total of 78 "courses of action". Almost half of these efficacious respondents (N = 31) declared some sort of direct communication with the university or with individual staff members would be the course available to them. The courses of action that were listed are:

	N
Communicate with university - with academics (23) - with the Vice-Chancellor (5) - have employer communicate with the university (3)	31
Communicate with the I.E.Aust.	15
Re-orient priorities, employ engineers from CAEs only, or from certain universities only	13
Press for more practical training in courses - have academics work in industry	6
Communicate with the university graduate foundation or the alumni association	3

	N
Engage in part-time teaching - organize symposia to get the message across	2
Contact the Association of Professional Engineers, Australia (A.P.E.A.)	1
Write to newspapers	1
Contact politicians, especially the Minister for Education	1
Other	4
	N = 78

[Responses to item 10* were not analysed in detail as most who answered "yes" to item 10 also answered "yes" to item 9. None who answered "no" to item 9 answered "yes" to item 10. When asked for "details", most who responded positively to 10 wrote "see reply to item 9" or "same as item 9".]

While almost one half of the respondents felt there was some course of action they felt they could take if they were not satisfied with a course,

---

* Item 10 was "If you are not satisfied with an engineering course presently being offered by an Institute of Technology is there any action you could take?" If "yes", please give details ..."

responses to item 13* showed that the majority in fact had either formally or informally expressed dissatisfaction with an engineering course (N = 78 or 51%). 39% of all respondents had expressed dissatisfaction with a university course and 20% had expressed dissatisfaction with a CAE course (some had expressed dissatisfaction with both). 24% expressed their dissatisfaction to a professor, or head of a department, 33% had done so to other academic staff, 35% to a non-academic colleague and only 12.4% to the I.E.Aust. (exceeds 100% because of multiple responses).

When one compares efficacy (item 9) with actual action (item 13) differences become evident. Approximately half said that there was some action they could take (item 9), yet when the responses of

---

* Item 13 was "Have you, since graduation, either formally or informally expressed your dissatisfaction with an engineering course (please write "yes" or "no" in each box): formally [ ], informally [ ], university course [ ], college/institute course [ ], to a professor or head of department [ ], to other academic staff [ ], to a non-academic colleague [ ], to the I.E.Aust. [ ].

these respondents to item 13 are analysed, it can be seen that 39 (59%) only, had ever formally or informally expressed dissatisfaction with a course, while 27 (41%) had not done so. Of those who did not think there was any course of action open to them if they disagreed with a course, 30 (44%) had, in fact either formally or informally expressed dissatisfaction while 40 (56%) had not.

The situation then, is one in which 44% of those who did not think there was any course of action open to them had, in fact expressed feelings of dissatisfaction. The following table can be constructed from the responses of those who replied both to items 9 and 13 (N = 136).

	had actually expressed dissatisfaction with courses	had not expressed dissatisfaction with courses	Total
efficacious	39	27	66
non-efficacious	30	40	70
Total	69	67	136

Four groups, not differing greatly in size, expressed the following viewpoints:

1. 29% thought there was action they could take over their dissatisfaction with a course, and had expressed this dissatisfaction;
2. 20% thought there was action they could take if dissatisfied with a course, but had not expressed dissatisfaction (for any of a number of possible reasons);
3. 22% did not think there was any action they could take, but had expressed dissatisfaction with courses nevertheless;
4. 29% did not think there was any action they could take and had not expressed dissatisfaction (for any of a number of possible reasons).

It is of interest to speculate whether some of those who had not expressed dissatisfaction could well change their opinion regarding efficacy if they were to have cause to express dissatisfaction - and vice versa.

When cross tabulating the responses to item 9 with other items it became evident that the efficacious respondents had slightly different response patterns to the non-efficacious respondents. Efficacious respondents declared more strongly that views of industry should be considered in both university and CAE courses, and by a small margin (compared with non-efficacious respondents) claimed that universities and colleges were more willing to listen to criticism (29% and 49% respectively for the efficacious respondents, c.f. 23% and 39% for the non-efficacious respondents). 17% of efficacious respondents claimed that views of industry were being adequately considered in university courses while only 4% of non-efficacious respondents claimed similarly. The respective responses for CAEs were 36% and 19%.

These very low positive responses reflected the dissatisfaction that is felt but not generally expressed. The lack of expression highlights the possible limitations on the use of personal connection as the main channel of access. The targets here could deal only in specifics and this probably would not be sufficient to incorporate across-the-board consideration of the (diffuse) views of industry. It reflects further, that the formally established bodies, particularly the visiting committees, do not generate a great deal of confidence among engineers in industry.

The responses of university graduates were compared with those of college diplomates, and the responses of those working in private industry were compared with those who were government employed. The difference in response between those in private industry and those in government employment was negligible.

There were differences, however, when the responses of the university graduates were compared with those of the diplomates. The university graduates generally seemed more favourably disposed to universities, while the diplomates generally felt more favourably disposed to the colleges. For example 31% of graduates thought that universities were willing to listen to industry's criticism of their courses while only 19% of diplomates thought so. 56% of diplomates, however, felt that CAEs were willing to listen to industry's criticism of their courses while 31% of graduates thought so. 15% of graduates thought that views of industry were being adequately considered at present in university courses (34% disagreed), while only 5% of diplomates thought so (48% disagreed). 37% of diplomates, however, felt that views of industry were being adequately considered at present in CAE courses while only 22% of graduates thought so.

In response to item 8*, 51% of the diplomates, not unexpectedly, thought that Institutes of Technology serve the profession better than do universities, while only 11% of graduates thought so. With regard to efficacy the differences were not marked, except that more diplomates had actually criticized university courses (32%) than graduates CAE courses (13%).

Apart from very general statements such as "there are engineers on the Councils of some universities", the interviewees did not feel particularly efficacious regarding participation in academic decision making. Generally they approved of the position as it exists, and it could be argued that approval makes action unnecessary. One could argue that there is approval because the network of informal contacts has led to a situation where the interests of industry have in fact, been latently and unofficially taken into account.

---

* Item 8 was "Institutes of Technology serve the profession better than do universities".

The questionnaire respondents' expression of their disapproval that industry's views were not being adequately considered, reflects attitudes towards the educational bodies as a whole. The network of informal contacts, however, has led to a situation where some interests may, in fact, have been taken into account by individual academics.

In brief, the major channel of articulation is personal connection, and the styles of articulation are latent rather than manifest, and diffuse rather than specific.

INDUSTRY AND THE I.E.AUST.

When discussing the I.E.Aust., the interviewees stressed the importance of academic autonomy, and expressed opinions that the universities and colleges, and not the I.E.Aust. made decisions about courses. University and college decisions were made, it was suggested, with an eye to I.E. approval.

> "The I.E. doesn't interfere with courses, but its a good idea for them to be in on the ground floor when new universities and colleges start up."

> "If a course became too way out, the I.E. would protest. Otherwise it wouldn't interfere."

Others saw the position of the I.E. differently -

> "The I.E. has a profound influence. No university should put on a course that would not receive recognition."

One feature that was mentioned by two respondents is that undergraduate students should be taught about the I.E. and encouraged to join. They saw this as a very important part of the educational/socialization programme.

The key observation, however, was that much of the contact and interaction is informal and unofficial.

> "The I.E. does not determine courses - well not in any official way. There are lots of unofficial contacts. Most academics are I.E. members anyway, and there's no conflicting loyalty at all - we're all heading in the same direction."

The questionnaire respondents were roughly evenly divided on whether the Institution should co-ordinate all professional engineering education in Australia - 46% agreed that it should, 41% thought it should not and 13% were not sure. There were no appreciable differences between the responses of graduates and diplomates. In response to item 9 almost one quarter of the efficacious respondents replied that they would communicate with the Institution of Engineers if there was a course with which they were not satisfied. Of those who had formally or informally expressed dissatisfaction with an engineering course, only 19% had expressed their dissatisfaction to the I.E.Aust.

The Institution of Engineers which plays a significant role in making its policies on engineering education felt, is not regarded by its members as an efficacious sounding board on engineering education. Members clearly prefer as the questionnaire shows, to express their opinions directly (and almost always informally) to those in the universities and colleges.

It is of interest to compare the statements of the interviewees with those of the questionnaire respondents. The interviewees were members of an important national committee of the I.E.Aust. and in a much better position to asses I.E. influence than the questionnaire respondents who were rank and file members of the I.E. As rank and file members the questionnaire respondents may have felt remote from the centres of organizational power. The interviewees, being near the centre of power would appreciate the influence wielded under the guise of organizational power and prestige. It is interesting to note, as the quotation above (p.280) shows, that great faith is placed in informal and unofficial contacts between academics and the I.E. hierarchy.

PUBLISHED STATEMENTS AND OPINIONS ON THE RELATIONS BETWEEN INDUSTRY AND EDUCATIONAL BODIES

Most of the literature here consists of comments by individuals in industry, and formal statements attributable to the educational bodies. The comments of the individuals were usually quite personal and impressionistic. They appeared to be little more than extensions of the material covered in interviews, and for this reason, a brief survey only, will be made.

There were critical comments on the universities, typified by the observations of H.J. Brown.[3]

---

3. Mr. Brown, a former university professor of electrical engineering is Technical Director of Philips Industries Limited, a major international technological corporation. The paper referred to is H.J. Brown. 1969. Efficient for What?, a paper presented at the 1969 Symposium of the University of N.S.W. - The Efficiency of Australian Universities. Proceedings of the Symposium were published by the University, but citations here are to a mimeographed copy of Mr. Brown's paper.

Brown launched into his argument after claiming that in industry one hears trenchent criticism by graduates, of universities and the attitudes of their staffs. The reason, Brown believes, is "that the governments, industry, and business are all fairly unanimous in their opinion [of the role and function of universities] but the universities (or at best, some of their staff) are not yet in accord with this opinion."[4]

The functions, Brown says, are the teaching and research functions, but the priorities of the universities are wrong, for teaching takes second place to high powered, and often inappropriate research, and training for research. This is a completely inefficient situation, for not only is the research inappropriate, there is too much inbreeding in the universities. Those who excel in research stay on in the universities. Those who do not often go out into industry, and the two groups seldom interact. The stinging criticism Brown makes is that "there is insufficient motivation to adopt an attitude of serving the community rather than

4. ibid., p.2.

seeking acclaim within their own narrow specialist circle."[5]

Because Brown feels that universities do not take teaching seriously, and do their high powered research haphazardly,[6] Government and industry are giving growing amounts of support to the CAEs. This, he says, is a direct result of a certain amount of disillusionment with universities.[7]

The employers are not immune from criticism. To an extent, says Brown, they often do not appreciate the contribution that graduates can make, and by giving them jobs with insufficient responsibility and accountability, and not employing graduates in a wider range of activities they force "staff and students back on themselves and the university environment and on fundamental research".[8] He sees a growing separation between academic scientists and engineers, and industrial scientists and engineers.

---

5. ibid., p.4.
6. ibid, pp. 8-9.
7. ibid., p.7.
8. ibid., p.10.

Brown's comments are by no means atypical in industrial circles. It is of interest, however, to compare them with comments made by people in authoritative positions in the universities. The Australian Vice-Chancellors' Committee reported:

> The Committee is aware of the need for close links between the universities and commerce, industry, and Government. Collaboration is necessary to ensure, among other things, that the courses offered by universities are what eventual employers of the graduates require; that they are relevant to the needs of present day society; that research effort is not duplicated and that it is directed towards the national interest; that there is not an oversupply of graduates in some areas. [9]

The A.V.C.C. regretted, however, that there has been a reluctance of universities and industry to collaborate. It stressed the need for close co-operation.[10] Brown quoted comments from four Australian Vice-Chancellors, all of whom felt that more co-operation was needed and that more should be done on this score.[11] This contrasts with the

---

9. Australian Vice-Chancellors Committee. <u>Chairmans Report on the Years 1967-70</u>. A.V.C.C. No publication details. para. 9.3.1., p.63.

10. <u>ibid</u>., para. 9.3.5., p.64.

11. Brown. <u>op.cit</u>., pp.3-4.

high rate of contact that is reported between industry and the colleges of advanced education.[12]

In 1964 the University of N.S.W. held a symposium on "The University and Industry"[13] and paper after paper in this symposium stressed the need for more co-operation between industry and the university. Perhaps this is all a well-worn ritual. Both sides say they should see more of each other for there are great benefits for all concerned. The

---

12. One of the many examples occurred at the 1970 Warburton Conference on Challenges facing Advanced Education. The comments of Mr. J.H. Ross, General Manager of Commonwealth Industrial Gases, are illuminating: "Five or six years ago I was invited to join the Council of the Preston Institute of Technology. Shortly afterwards, I was pressed into service on the Mechanical Engineering Faculty Advisory Board. Through this I had contact with Harold Jones, head of the Department of Mechanical Engineering. Harold soon approached me on the possibility of first year diploma students visiting our works as part of their introduction to industry. Accordingly we developed a programme which included a tour of our works, short papers by staff engineers on a variety of subjects ..." D.J. Golding _et al_. (Eds.). 1970 _Challenges Facing Advanced Education_. Melbourne: Hawthorn Press. pp.47-48.

13. University of N.S.W. 1964. _University Symposium on the University and Industry_. Kensington: University of N.S.W.

universities and colleges have set up visiting and advisory committees. Industry readily participates. Both representatives of industry and academics at times doubt the committees' general usefulness. While official channels have been established, both sides prefer to express their interests through informal means. The ritual of decrying the lack of co-operation continues, but the interests of the relevant parties have been stated.[14]

DISCUSSION

The important questions relating to what industry perceives and what it wants, and the power of industry can now be discussed.

It was stated at the beginning of this chapter that industry presents its interests to the

---

14. There has been no attempt in this thesis to discuss the many papers which argue that higher educational institutions are subservient to industrial values. See for example, D. O'Neill _et al_. (Eds.). 1970. _Up the Right Channels_. _The University of Queensland_. Brisbane. _passim._, but especially pp. 44-50 and 186-190; D. White. 1972. Education and capitalism. In J. Playford and D. Kirsner (Eds.). _Australian Capitalism_. Ringwood, Victoria: Penguin Books., pp. 219-247; R. Birrell. 1972. The 'community' and the Colleges of Advanced Education. _Australian Journal of Advanced Education_. 2(4), 10-17.

educational bodies in the hope that the courses decided upon will be suitable for industry. It has been shown that nearly all (approximately 97%) engineers in industry firmly believe that this should be so; that considerably fewer (25% and 41% respectively) said they thought that the universities and colleges are willing to listen to criticism of courses; that approximately half (48%) believed they could take action on a course with which they were not satisfied; and that approximately half (51%) had, in fact, tried to take action. 29% both believed they could take action and had tried to; 29% thought they could take no action and had never tried (probably they were not dissatisfied). Only 10% however, thought that the interests of industry were being adequately considered in universities (26% thought so for the colleges).

As "industry" is only a very loose description of largely unconnected entities, there has not been mobilization to build upon these attitudes. As a result the interests expressed by industry are informal and perhaps lack a focus. The point to highlight here is the informal nature of the presentation of interests. The respondents indicated strongly that informal contact was the most prevalent form of contact. Academics who were surveyed (see Chapter IX below) concurred that informal contacts with industry provided the basis for most liason.

Nevertheless the evidence presented shows that respondents in industry are of the opinion that industry's view should be considered by the educational bodies, but generally do not believe that they are being successful in having their views implemented (above p. 271-2). Even "efficacious" respondents do not claim that views of industry are being adequately considered in universities (17% thought they were, 47% thought they were not). These respondents said there was a course of action open to them, but they also indicated it has not produced the desired results.

In terms of academic autonomy the universities are seen to be resisting the demands of industry. The evidence shows that colleges are less inclined to resist industry's demands (and more inclined to accommodate them).

Both the interviewees and the questionnaire respondents doubted there was much tangible influence they thought they could exert. This is an interesting comment on the Visiting and Advisory Committees, and points to the lack of importance of the formal bodies formed by the university and college to accommodate and channel interests.

The existence of these bodies could possibly be explained by arguing that the university authorities believed that while there was a high level of subjective freedom, there was not as much objective freedom, and the situation could best be handled by channelling interests through formal structures.

Formal and institutional channels, in fact, are unimportant as channels of interest articulation when compared with personal connection. This might reaffirm the individual academic's view of his own subjective freedom, but the evidence presented in Chapters VI, VII and IX shows that the interests of Government and the I.E.Aust. are important course determinants and thus are limits on objective freedom.

SUMMARY

Unlike the other actors, "industry" is not a cohesive or unified entity. It has been shown, however, that there is a range of views and opinions to which a significant numbers of engineers in industry subscribe. "Industry" wants:

(a) an engineer who can perform his job adequately;

(b) an engineer who is not "overtrained", i.e. whose training fits the expectations and requirements of his employers;

(c) an engineer who has a positive commitment to the present role of engineering in industry and in the community;

(d) industrial views to be taken into account in planning university and college courses.

These interests are pursued by engineers acting in manners that are both formal and informal. In a formal manner industrial engineers play a role in the universities and colleges by being members of visiting committees, advisory committees, the governing body, and in some Australian universities, members of the Engineering Faculty. In an informal manner there is some contact between academics and engineers in industry. The amount of contact depends on the individuals concerned. While provision for formal contact exists, most contact is quite informal.

"Industry" then, has a set of interests. These interests can be thought of in terms of influences that are brought to bear on the educational institutions. They may be important in determining curricula. They are non-academic influences.

CHAPTER IX

EVALUATION BY ACADEMICS OF THE INTERESTS AND ACTIONS OF THE INSTITUTION OF ENGINEERS, AUSTRALIA, INDUSTRY AND GOVERNMENT

> "Today universities have become primarily professional training schools. Many academics regret this, some deny it." [1]
>
> — Sir Philip Baxter,
> former Vice-Chancellor,
> University of N.S.W.

INTRODUCTION

The workings of the formal hierarchy of authority as shown in Chapter V are not a sufficient explanation of the factors that determine the content and structure of engineering courses. The last three chapters have shown that Government, the Institution of Engineers, Australia, and Industry, have a profound interest in these matters. To the extent that these institutions can affect the content and structure of courses, notions of objective and subjective autonomy must be reconsidered.

---

1. Baxter, J.P. 1968. Problems in the administration of modern universities. Australian University, 6, p.103.

This chapter will show that academics in the education institutions <u>feel</u> that they are free - that they have a high degree of subjective freedom - that this is part of their professional/academic ethos.

According to this ethos they should, ideally be in a position to develop policies relating to their teaching duties. As professional engineers and professional educators their knowledge and integrity is such that they should be able to devise educationally satisfactory courses for students of engineering. In an autonomous institution these people ideally should be the sole deciders of what constitutes a satisfactory engineering curriculum.

It will be shown in this chapter that the interests of the I.E.Aust., Government and industry are internalized by academics into their value systems. The result is that the interests of the three institutions become course determinants, and in Hofstadter's terms (above p. 123) there would be a low degree of "objective freedom" but feelings of a high degree of "subjective freedom".

To test this and also to discover the range of views regarding the development of the curriculum, and the extent to which non-academic interests are important, a sample of academics in engineering departments was interviewed.

The sample was made up of 40 academics, 28 from the University of New South Wales and 12 from the New South Wales Institute of Technology. At both institutions academics from the major engineering schools were interviewed. The 28 from the University of N.S.W. comprised 9 Professors, 4 Associate Professors, 6 Senior Lecturers and 9 Lecturers. The 12 from N.S.W.I.T. comprised the Dean, 4 Principal Lecturers, 2 Senior Lecturers and 5 Lecturers.

Except for Professors and Principal Lecturers the respondents were chosen at random from staff lists. (One half of the engineering professors at the University of N.S.W. and all but one of the Principal Lecturers at the N.S.W.I.T. were interviewed). Those at the university were written to and an appointment was subsequently made by telephone. Those at the N.S.W.I.T. were telephoned and an appointment made. The interviews lasted from about 45 minutes to about 90 minutes (most took about one hour) and ranged over a number of topics, particularly the respondent's view of his own (and his School's) autonomy; professional bodies, especially the I.E. Aust.; relations between the university/college and industry; academic standards and accreditation.

ACADEMICS AND THE INSTITUTION OF ENGINEERS, AUSTRALIA

It was shown above (Chapter VII) that the I.E.Aust. wants a high, exclusive status for its members; that it wants to control entry to the profession; that it wants to foster a professional ethos. These are central interests of the I.E.Aust., they are non-academic interests, and the question arises of how these interests (and others) are perceived by those responsible for the educational programme.

Academics who value autonomy as an integral part of their profession do not always see the non-academic interests of the I.E. as limitations on their autonomy. Academics at the university were interviewed to discover how autonomous they thought the Faculty of Engineering was in determining the programme designed to train engineers. 13 (47%) of the university respondents replied immediately that the Faculty and Schools were completely autonomous. This expression of autonomy was often qualified, e.g.

> Except for very broad limits the faculty is autonomous. The I.E. <u>could</u>, but doesn't influence courses. All course changes, however, have to be notified to the I.E.
> [University Professor]

These 13 stated that the Faculty was completely autonomous, even if it did have to report to the I.E. They did not regard the influence of the I.E. as undesirable in any way, e.g.

> Because of our standards it is inevitable that we fulfil the minimum I.E. requirement.
> [University Professor]

> The I.E. does not play an excessive control role. They try to maintain a standard and we're in agreement with them. No, I don't think this is a restriction or a problem.
> [University Lecturer]

The other 15 respondents (53%) expressed some resentment of the role of the I.E.Aust. Some saw it as a definite restriction on their autonomy and expressed this in quite vehement terms. The vehemence of feeling against the I.E. was quite intense. It was expressed in much stronger terms than was support for the I.E.

There is a definite restriction to our autonomy. One example is the way in which the I.E. has announced it will no longer recognize our six year part time course. Most members of the staff think the course is satisfactory, but the I.E. says its too short - and because of this there will be a course revision here at U.N.S.W. This is not the first course that the I.E. has influenced.
[University Professor]

We are not autonomous. We are limited by the I.E. ... we are bowing to their pressure.
[University Senior Lecturer]

The I.E. does interfere. It lays down details of subjects - certainly it lays down number of hours and length of courses.
[University Senior Lecturer]

There are people who would like to teach certain stuff, but the I.E. doesn't like it and so it's not taught.
[University Associate Professor]

The I.E. has a terrible influence. They have caused us to change courses quite dramatically. They lay down the number of class contact hours. We are forced to teach only in certain areas. We can't put into our courses what we want to - what <u>we</u> think is best.
[University Lecturer]

There is a great deal of apathy - academics won't take the I.E. on. Often it's not worth the effort.
[University Professor]

What bugs me is that an outside body tells us our courses are no good - <u>we</u> ought to be calling the tune - <u>we're</u> the university.
[University Lecturer]

While approximately one half of the sample thought the I.E. was not exceeding its bounds or acting improperly or restricting autonomy, the other half did, and they expressed their views in much stronger terms than the I.E.'s supporters. While some of the younger lecturers were <u>most</u> vehemently opposed to the role of the I.E., there was no distinction, on the age variable, between supporters and non-supporters. It is noteworthy that nearly all (in both groups) were members of the I.E.Aust.

There are three positions to be noted:

(a) Those who see themselves as autonomous (47%) and those who do not (53%);

(b) those who are happy with the situation - "supporters" (57%) and those who are not - "opponents" (43%); and

(c) those who admit that the I.E. exerts a direct influence on courses (35%) and those who do not admit that the I.E. exerts a direct influence on courses (65%).

The line between support and opposition of the role of the I.E. is sometimes difficult to draw because respondents often qualified their stances.

The following two statements, both made by professors, sum up different positions. The first was made by a respondent who was happy with the position, who claimed the School and Faculty were autonomous, and that there was no direct influence from the I.E.

> The I.E. doesn't <u>interfere</u> with our courses. It just accepts or rejects them.
> ["supporter"]

Compare this with

> The position can be likened to that of a sword hanging over us - it never falls.
> ["opponent"]

The latter opinion is typical of the opponents' opinions. They resent, very much, the sword that hangs over them.

The former statement is typical of the supporters' opinions. There is "complete freedom" - <u>so long as people act within the set limits</u>. It follows that they do not admit to any direct influence from the I.E.Aust. Many of those who see themselves as completely autonomous do not see - or do not want to see - limitations to full autonomy, e.g.

> While we are <u>completely</u> autonomous and while there is no <u>direct</u> coercion, we would be stupid if we did not fulfil the I.E. requirement.
> [University Professor]

> The I.E. doesn't pressure us. It merely states its position. The problem is now with us.
> [University Professor]

> We must ensure that our degree is recognized by the I.E. - this is always at the back of our minds. However, what they require is what we think should be taught anyway.
> [University Lecturer]

> An intervention from the I.E. is not really an intervention.
> [University Senior Lecturer]

The I.E. clearly plays a significant and important role - a role that is noted by the academics.

Some academics note and resent the role it plays while many others, as the quotations directly above indicate, do not perceive the actions of the I.E. as restricting their autonomy, although they say that they are autonomous so long as they stay within limits prescribed by the I.E.Aust.; within these limits the I.E. does not interfere.

On the basis of these responses and the evidence presented in Chapter VII, it can be stated that the interests of the I.E.Aust. influence engineering courses at the University of N.S.W. Academics are divided on the extent to which they see this as a restriction to their autonomy. They are divided also on the extent to which they are satisfied or happy with the position, and on whether they see the I.E. exerting a direct influence on their courses.

Taking these three positions

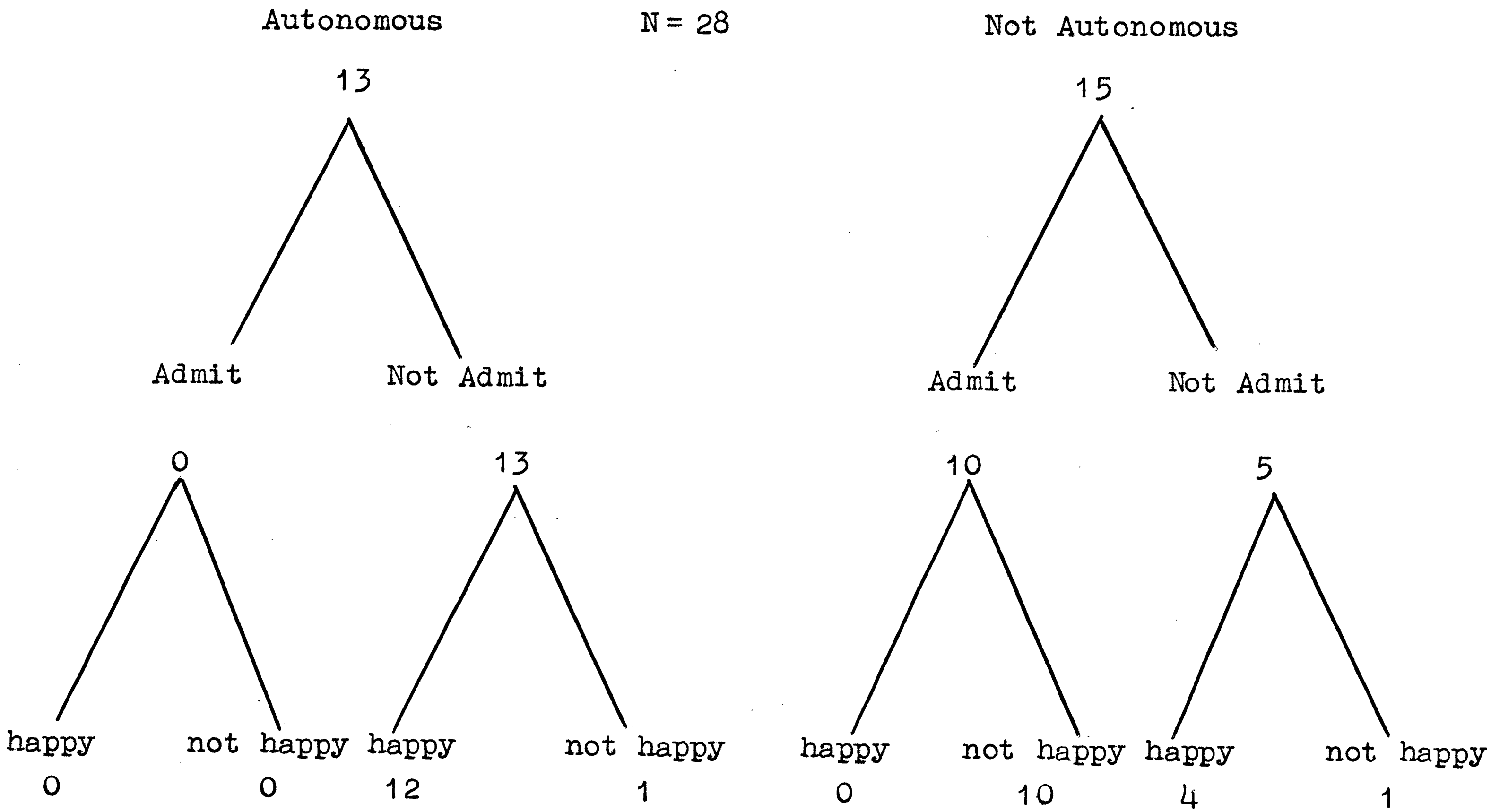
(a) seeing themselves as autonomous or not (autonomous/not autonomous);

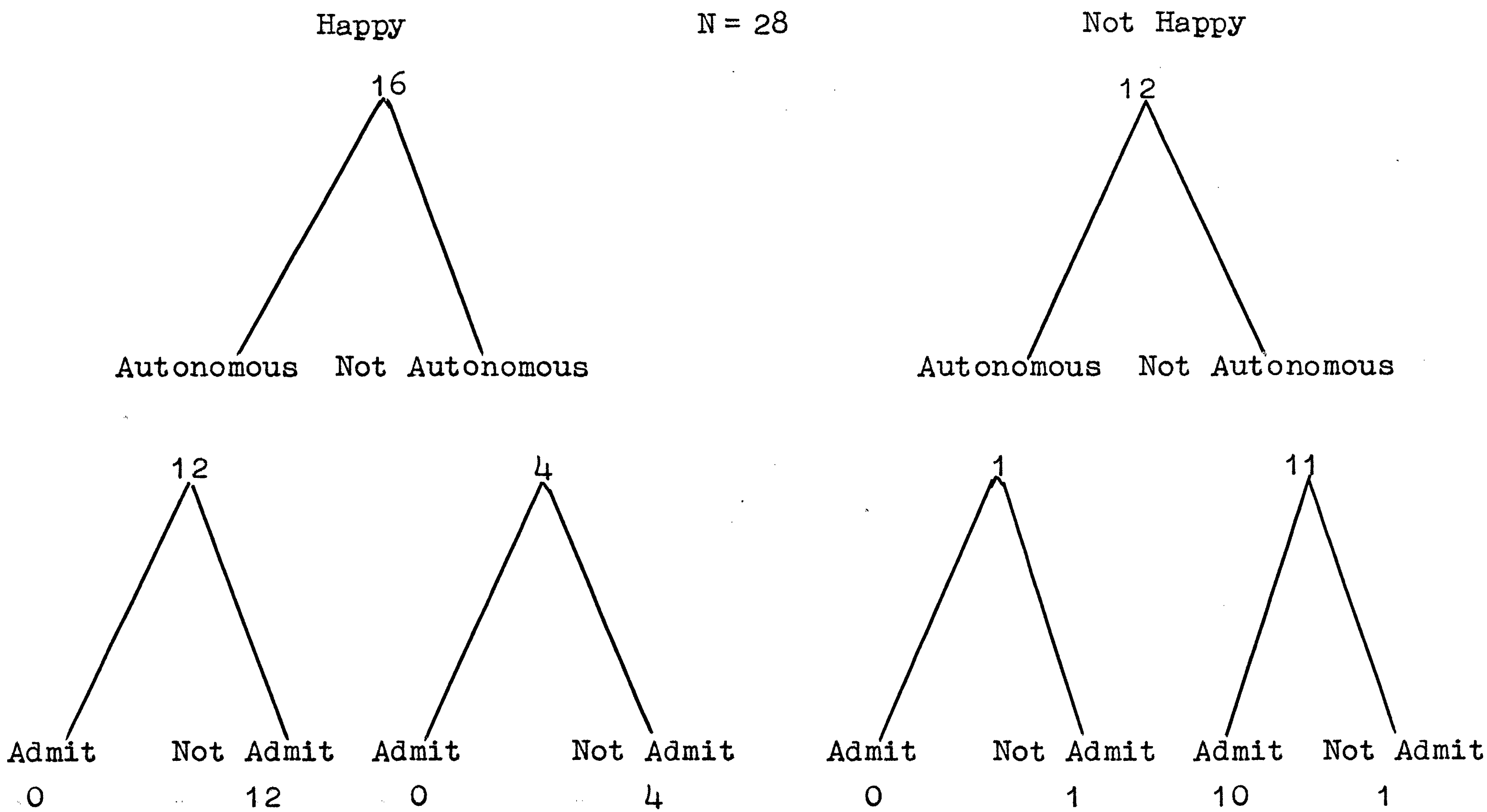
(b) satisfied with the situation or not (happy/not happy); and

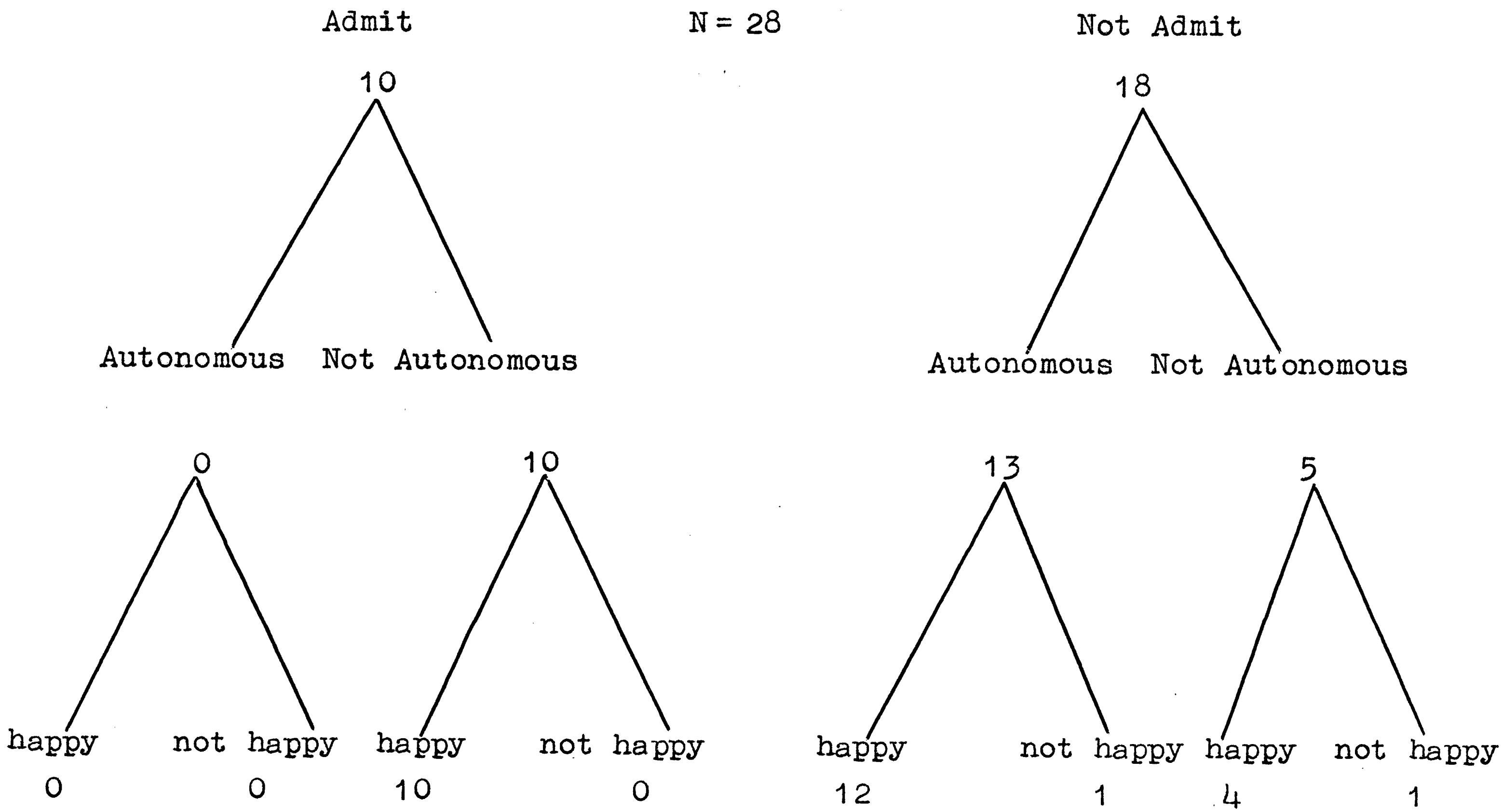
(c) admitting that the I.E. exerts a direct influence on not admitting this (admit/not admit);

the divisions can be seen more clearly.

Most (16 or 57%) of the respondents were generally happy with the situation. A sizeable number, however, 12 (43%) were not. The largest sub-group, 12 (43%) claimed they were happy with the position; that they were autonomous; and that there was no influence exerted by the I.E. on them. The next group, 10 (35%) were not happy with the situation, did not think they were autonomous; and admitted that the I.E. was exerting influence on courses. In all, 18 (65%) would not admit that the I.E. exerts any direct influence on their courses.


Autonomous
N = 28
Not Autonomous
13
15
Admit
Not Admit
Admit
Not Admit
0
13
10
5
happy
not happy
happy
not happy
happy
not happy
happy
not happy
0
0
12
1
0
10
4
1


N = 28
Happy
16
Autonomous
Not Autonomous
12
Admit
0
Not Admit
12
4
Admit
0
Not Admit
4
Not Happy
12
Autonomous
Not Autonomous
1
Admit
0
Not Admit
1
11
Admit
10
Not Admit
1


Admit
N = 28
Not Admit
10
18
Autonomous
Not Autonomous
Autonomous
Not Autonomous
0
10
13
5
happy
not happy
happy
not happy
happy
not happy
happy
not happy
0
0
10
0
12
1
4
1

Almost two thirds, then, could be viewed as people who believe they have a great deal of subjective freedom, even though there may be limitations to their objective freedom, e.g.

> The I.E. doesn't <u>interfere</u> with courses - it just accepts or rejects them.

In Marxists terms these respondents would be seen to be imbued with "false consciousness". The Marxist would say their situation is "oppressive", yet they are not aware that they are "oppressed".

The perceived styles and channels of interest articulation will be discussed at the end of this chapter.

The emphasis at the N.S.W. Institute of Technology was quite different regarding the I.E.Aust. The vehement opposition to the I.E. that was found at the university was not present at the Institute. In the N.S.W.I.T. sample of twelve, six saw themselves free from I.E. control and six saw themselves subject to it.

The 50% who saw themselves subject to I.E. control were not as resentful of the situation as were the 53% of the university sample. The Institute academics regarded this as the price that had to be paid in order that the I.E. might accredit their courses.

> The I.E. certainly acts as a constraint, but I must accept any I.E. decision. I owe it to my students to get professional recognition.
> [College academic]

> I don't think we would ever put on a course that would not be accredited by the I.E. That would be a grave disservice to students.
> [College academic]

> We are all I.E. members and as such are unlikely to go off at a tangent that would be unacceptable to the I.E.
> [College academic]

> We are completely autonomous. The only restriction is the I.E. _I_ don't feel constrained though the head of the school does.
> [College academic]

> The requirements of the I.E. are met by design, not by accident. This is a laudable thing.
> [College academic]

The strongest statement came from a senior academic who said:

> The I.E. is an _overriding_ factor. We can't experiment too much. You must submit your course for approval. It is purely a value judgement whether a particular subject should be included.
> [College academic]

This academic and several others made the comment that the I.E. did not involve itself in minute course details, and that one could put forward a course, the description of which was very general, and proceed to teach what one wished within that framework.

At the N.S.W.I.T. the interests of the I.E. Aust. also influence course determination, but, it is maintained, the ability of the I.E. to confer status on the diplomas and degrees compensates for any restrictions on autonomy that might exist, or be seen to exist.

ACADEMICS AND INDUSTRY

It was shown above (Chapter VIII), that "industry", although not a cohesive entity, represents a range of wants. "Industry" wants an engineer who can perform his job adequately; an engineer who is not "overtrained"; an engineer who has a positive commitment to the present role of engineering in industry and the community.

"Industry" obviously has a number of interests. These are non-academic interests and some of them influence the curriculum. Many universities and colleges, faculties, schools and departments seek the views of industry in developing programmes and facilities, and in planning courses. It was shown above in Chapter VI that Government has encouraged industry to express its interests to the educational bodies, especially to the colleges of advanced education. The interests of industry are certainly a limitation to the objective freedom of academics, though not necessarily a limitation on the subjective freedom of the individual academic.

When the university academics were asked about the relationship between their school and industry, about half said there should be closer liason and more contact, and about half thought things were satisfactory as they were. The responses depended, usually on whether the individual did any consulting for industry. Most of those who act as consultants were satisfied with the amount of contact that existed. An individual's consulting puts him in a position where influence can very easily be exerted on him. The nature of this influence will almost invariably be informal and latent.

When asked whether industry exerts any influence on the School or Faculty, there were three sorts of responses.

Some, N = 10 (36%), said that industry exerted no influence at all on the School or Faculty. A majority, N = 17 (61%), said there was an influence, and described it as a positive, or beneficial, or worthwhile influence. Only one respondent (3%), a professor, said that industry exerted a "poor" influence on the Faculty. This respondent said it was the duty of the university to educate generally with a thorough grounding in fundamentals, but industry, he said, claimed that graduates were "too theoretical".

> We know industry's view - obviously we don't succumb to that pressure.

This view was obviously not shared by other academics:

> Industry exerts <u>no pressure</u> whatever.
> [University Professor]

> Industry doesn't really know what it wants, so there is no pressure.
> [University Senior Lecturer]

> I have <u>never</u> been influenced from outside the university.
> [University Professor]

> We go on our merry way without any influence from industry although we make a product directly for them.
> [University Senior Lecturer]

Several academics regretted the fact that industry was not in a position clearly to communicate interests to the School:

> Industry is not organized and so does not present a single unified view.
> [University Professor]

> Industry doesn't really know what it wants so there's no pressure.
> [University Senior Lecturer]

> The variety of employers is such that they themselves realise that they cannot exert any pressure.
> [University Professor]

> We invite industry and seek their advice. Faculty should take note of well informed criticism from industry, but it is very seldom forthcoming.
> [University Professor]

Some interests appear to be transmitted and, as many academics feel their duty is to train engineers, the interests are noted and often accommodated.

> There is some pressure from industry - we tailor to their requirements. We're quite happy about this as our function is to train engineers.
> [University Lecturer]

> We provide a service to industry and we must think in these terms.
> [University Senior Lecturer]

> We must satisfy the demands of industry - most of our graduates are employees.
> [University Lecturer]

> Industry comes up with a lot of hot air ... they cannot be brushed aside entirely because they employ our graduates.
> [University Associate Professor]

> There is no external pressure in any definable sense. ... We try to make students employable. We are influences to the end that future employers might expect ... but this influence is very intangible.
> [University Lecturer]

The University has established Visiting Committees in the engineering schools. While there is a range of opinion on the effectiveness of the Visiting Committees, most academics do not regard them as any sort of constraint, or for that matter, particularly effective:

> Faculty decides its courses and only after the courses have been decided are they perhaps, referred to the Visiting Committee.
> [University Professor]

> Visiting Committees are a useful forum for discussion, but they do not make any important decisions - they (industry) discuss - we (academics) decide.
> [University Professor]

> Visiting Committees don't have much influence because they're carefully picked by the Head of School.
> [University Professor]

> Visiting Committees are <u>used</u> - used as a weapon against the Vice-Chancellor. <u>They</u> tell him the deficiencies - <u>they</u> write letters to the Vice-Chancellor. We use them. They don't pressure us. They are used mostly for internal politics.
> [University Professor]

> The Visiting Committee does not force course changes - if they were influential and successful there would be a solid management component in courses now.
> [University Professor]

That the university is close to the profession is sometimes a cause for concern. In addition to the formalism of the Visiting Committee there appears to be an informal link between industry and the university - an informal link where academics may be subject to influence and not aware of it.

> In professional courses we must take note of external forces, but they must be tempered with educational ideals. ... I often worry about being in a university and being so close to the profession.
> [University Professor]

> We try to get criticism from the profession but they are reluctant to advise us much ... anyway I have a lot of social contacts with people in industry.
> [University Professor]

> Communication and interaction is always informal.
> [University Professor]

> Industry has never had a course altered - certainly not formally.
> [University Senior Lecturer]

Interests of industry it appears are noted, are sometimes sought, but are not communicated formally to the academics. Examination of the evidence presented above (and in response to item 13 of the questionnaire, see above p. 273) could lead to establishing a case that if industry exerts an influence on university academics, it is indirect, informal, and often not perceived as such. Again there is evidence of a high level of subjective freedom, but perhaps a low level of objective freedom.

The N.S.W.I.T. sees itself as turning out a product that is directly and immediately of use to industry. There are two ways in which this is achieved. First, there are no full time students. All students undertake their courses on either a part time or a sandwich basis. In order that this might be successful there must be harmonious relationships between the Institute and employers, if only to negotiate arrangements relating to time off from work, but more importantly, to work out a suitable educational/training programme. The second is through the extensive use of advisory committees to ensure that what is taught is what is required.

It was shown above that Government expected industry to exert pressure on the colleges. How do the college academics react to this pressure?

> I'm very happy with the relationship that exists between us and industry. I left the university because they don't care about industry. ... We produce professional engineers for industry - not for research. [College academic]

> Our courses could not have got off the ground without the support of industry. [College academic]

> Relations between us and industry are very cordial. They would not try to influence our courses. They are very generous with prizemoney, but they do not pressure us ... there is lots of informal contact. [College academic]

The respondents generally fell into one of two camps exemplified by the following statements:

(a) "Contact and liason is very good - I'm happy with it as it is."

(b) "Contact and liason is quite good. I'd like to see some more however".

"The Advisory Committee", one academic said, "is the common meeting ground".

Some found the Advisory Committees very useful:

> We work closely with the Advisory Committees. They meet 2-3 times per year. There's a lot of discussion on the syllabus, failure rates etc. We ask them for advice. They can't <u>force</u> us to do anything. [College academic]

> The Advisory Committee is an important body. They would have more weight than any other body - they look at course content. We work out the course - our school head modifies it - then it goes to the Advisory Committee and then to the Advanced Education Board. Before the A.E.B. was formed the Advisory Committee had a much stronger influence.
> [College academic]

As the Advisory Committees are made up of representatives of particular industries, there is always the danger that certain individuals might try to influence courses so as to benefit their particular company or industry.

> During the formative years of the N.S.W.I.T., Advisory Committees played a gigantic role. They should be done away with now - they've outlived their usefulness. Advisory Committees push their own barrows. Some representatives are here to make a quid - there's a lot of abuse.
> [College academic]

> Some industries say some courses are too theoretical - too analytical. One firm wanted to push its particular interest - soon he was squashed. Other academics back us up if we are taking too much notice of one particular industry.
> [College academic]

Other academics have rejected charges of "pushing one's own barrow":

> Advisory Committees have suggested modifications to courses and we have felt these to be reasonable.
> [College academic]

> Pushing one's barrow does not happen much in Advisory Committees. We would not want anyone who is a bullying braggart.
> [College academic]

Others still, had general doubts about the usefulness of the Committees:

> Advisory Committees meet only twice per year. The people on the Committee are very very busy people. Its just a farce.
> [College academic]

> The Advisory Committees are not realistic. People on the Committees are not in touch with industrial practice - they're too high up in management.
> [College academic]

The impression gained from the interviews at the N.S.W.I.T. was that the relationship with industry was quite different from that which existed in the university. Advice was sought more, and it was listened to. Co-operation with industry was not regarded as a restriction of academic autonomy. Further, it was felt that co-operation was absolutely vital and necessary, as this provided part of the rationale for the existence of this system of education.

Whereas academics in the university appeared unwilling to identify any influence that is exerted by industry on the engineering schools, academics at the N.S.W.I.T. were not in this position. If influence existed in the university it was informally presented and heavily disguised. At the N.S.W.I.T. the attitude was far more open. The Advisory Committees appeared to be more forthright and to be regarded more seriously than the Visiting Committees at the University of N.S.W. The fact that all students were doing part-time or sandwich courses put the staff into a special relationship with the employers. These conditions did not apply at the University of N.S.W. As with the I.E.Aust., the situation of academics in both institutions vis à vis industry is not whether influence is exerted by industry or not, but the extent to which the influence that is exerted is perceived, and admitted, and internalized by the academics.

GOVERNMENT POLICY - CAEs and UNIVERSITIES

It was shown above (Chapter VI) that Government expects the colleges of advanced education to be highly responsive to the needs of industry and the community.[2] Does this mean that universities are

---

2. See also R. Birrell, *op.cit.*

not as responsive as CAEs? Does this mean that non-academic interests are more prominent in CAEs than in the universities? How do academics in universities and CAEs see "the other body". The third part of the interview focussed on the university subjects' attitudes towards the CAEs and the college subjects' attitudes towards the universities.

The overwhelming majority of university respondents, 21 (75%), felt that CAEs were subject to much greater pressure than the universities.

> The I.E. is a much larger constraint on the CAEs than on the universities.
> [University Professor]

> CAEs feel more of an obligation to feel relevant to the community and they seek a lot of advice from outside.
> [University Senior Lecturer]

> CAE people are not interested in research. Their courses are set up to please industry.
> [University Senior Lecturer]

> There are more pressures on CAEs. Staff feel less independent. They feel they must service industry more - industry representatives bully them more.
> [University Lecturer]

The general feeling was that as the CAEs are relatively recent entrants to the educational field they have not really determined where they stand and so are subject to pressure from a variety of sources. Some university people thought the same standards of autonomy should apply both in the universities and in the CAEs. Others looked down very much on the CAEs and thought of them as most inferior.

It is of interest to note that six respondents at the university (21%) launched into a most bitter and vehement attack on the second rate nature of the colleges. These six comprised four Professors and two Associate Professors.

> CAEs are staffed in many cases by second rate people - hence they are open to more outside influences. Hasty educational planning has led to this situation.
> [University Professor]

> CAEs are a political football. The staffs want to increase their status and salary. They are second rate in most respects - second rate staff teaching what should be sub-professionals, and giving unreal degrees - they're just glorified technical colleges. There should be more stringent checks on them. They shouldn't give degrees. You can't turn a technical college into a university just by having it award degrees.
> [University Professor]

> CAEs were set up to train people cheaply.
> [University Professor]

> CAEs are completely under government control - the academics aren't academics - they're public servants.
> [University Associate Professor]

> No CAE would dare put on a course that would not receive recognition. They're in a position of weakness - they're on bended knees seeking recognition.
> [University Professor]

> CAEs are really under industry's thumb. Their courses are tailored to the requirements of the employer. A lot of CAE courses are rubbish - they teach far too few fundamentals - they're too closely related to fads and fashions. Some CAE graduates haven't got a clue a year or two out of college. The university graduates will be the bosses, the CAE graduates the workers.
> [University Associate Professor]

While there is this opposition to CAEs from some in the universities, it is of interest to note that the questionnaire found that engineers in industry thought equally favourably of both university and CAE courses. Of the high ranking industrial engineers who were interviewed, none spoke disparagingly of the CAEs. Some claimed that they would hire a graduate in preference to a diplomate or vice versa only if the applicants were newly graduated and if the job required a particular sort of skill. <u>All</u> stated that after 3-4 years the diplomate and the graduate were indistinguishable.

The academics at the N.S.W.I.T. did not feel inferior in any way. Most conceded that they were subject to more pressure than the universities, but this was because of the essential difference of their roles.

> University students are not trained for industry - ours are, and because of this, industrial representatives sit on many of our committees.
> [College academic]

> There is not the same deliberate attempt in universities to organize courses to meet the requirements of industry. ... We are consciously trying to turn out a particular sort of student. All our facilities are oriented to teaching, not research.
> [College academic]

> Our Advisory Committees probably do and say more than the Visiting Committees at the university.
> [College academic]

> Universities don't cater for industry in the same way as we do. ... Employers favour the sandwich course - they get more out of the sandwich student.
> [College academic]

> The university must pursue knowledge for its own sake. Their training is serial. Ours is concurrent. There is room for both. We have to prove ourselves more than do the universities.
> [College academic]

Some berated the universities for their attitude towards industry:

> Universities are arrogant - they don't care a bit about what industry wants.
> [College academic]

> Universities usually couldn't care less - they think they're in an ivory tower.
> [College academic]

The university academics regard a situation of an educational body, namely a CAE, subject to non-academic influence, as quite undesirable. The CAE academics regard a situation in which (university) academics remain aloof from community and industrial interests also as undesirable.

DISCUSSION

Nearly all respondents stated that non-academic interests affected CAE courses, and just over one half thought this was the case in the university. Most university respondents, however, were unwilling to admit that their courses were being directly influenced from outside the university. The values of the respondents in the two institutions showed through here, for while most agreed that non-academic interests were present, the difference was over whether this was seen as desirable. The CAE's community service role and close government/industrial/professional liason was valued by CAE academics, but belittled by university academics. The university's claim to "autonomy" was valued by university academics (perfunctorily perhaps), but regarded as aloof arrogance by CAE academics.

Both institutions have a formal mechanism for the communication of non-academic interests. The only formal channel at the University of N.S.W., the Visiting Committees, are held in low regard by the academic staff, and what meaningful contact there is with the I.E. and industry is quite informal. Contact with Government is formal, but potential for contact at the level of the individual academic is negligible. At the N.S.W.I.T., contact appeared to be much more open. The Advisory Committees are held in higher regard, they meet more frequently, and individual academics often meet with employers of their students to discuss courses, practical training and students' progress.

The position in the university is characterized by a low degree of objective freedom coupled with feelings of a high degree of subjective freedom. (In addition to the 13 who claimed they were autonomous many of the remainder stated that they were constrained into providing "acceptable" courses, but once in front of the class they <u>could</u> in many cases, teach virtually what they wished.) In the university situation the channels of interest articulation are the formal and institutional channels which perform with a manifest and diffuse style - manifest because of the formal nature of their organization and existence - and diffuse because of the implicit respect for university autonomy. Demands are not spelt out in too much detail or with too much specificity, and as a result one half state there has been no breach or compromise of autonomy.

Running parallel with the formal and institutional channel is "personal connection" - an equally important channel - the style here is much more likely to be latent and specific. The latent style gives the interaction an informal nature, and with this informality, specific demands can be presented - but within the context of the informality this specificity is not seen by many as a limitation on autonomy.

At the N.S.W.I.T. there are more non-academic interests openly in circulation, and these are more readily internalized into the value system of the academics and into the ethos of the CAE system.

The channels and styles of interest articulation fit under the same headings as in the university, but operate more openly and with less regard for the traditional view of academic autonomy, and with more regard for the expected contribution to industry and the community. This is because the setting and the ethos are different to that in the university.

While studies of these systems have different implications for the study of how the curriculum is determined and influenced, it can be seen that engineering courses are subject to a range of non-academic influences.

An analytical overview of these influences, their perception, their communication and accommodation and their effects makes up the next chapter.

CHAPTER X

AN ANALYTICAL OVERVIEW

INTRODUCTION

At the end of Chapter V a diagram was drawn in which interests were portrayed as confronting two barriers. One was an "objective freedom barrier" behind which was the university or college council. Interests which penetrate this barrier would be presented to "the university" or "the college". Behind this barrier was the "subjective freedom barrier", penetration of which involves interaction with the individual staff member or the (informally constituted) School or Department.

It has been shown that it is possible for interests to penetrate the first barrier and thus help determine the standards of objective freedom. It has also been shown that many respondents would not admit that the second barrier was being penetrated and that their subjective freedom was being limited. The subjective freedom barrier appears to be a more formidable barrier than the objective freedom barrier. Those presenting their interests to the universities and colleges may, however, be particularly interested in penetrating the objective freedom barrier and perhaps indifferent to the penetration of the subjective freedom barrier.

Chapter V ended with a number of questions. Which interests penetrate which barriers? What are the structures, channels and styles of interest articulation which allow for this penetration? Can one distinguish formal, informal, direct and indirect presentation of interests?

Examination of the interests of the academic policy makers and other influentials has shown consensus on some issues and conflict on others. Not only are there differences in the perception of the interests, there are differences in the way the actors formulate their demands, communicate demands, mobilize their resources, and have their demands translated into policies. The factors that affect course determination are interests which are both formally and informally presented, and are communicated through both direct and indirect channels.

UNIVERSITIES AND COLLEGES

Before the universities and colleges determine their policies they must take into account the following factors, all of which penetrate the objective freedom barrier.

Formal/direct

- allocation of finance (Government)
- production of A.U.C. and A.C.A.E. reports (Government)
- Visiting and Advisory Committees (Industry)
- manpower provision (Industry/Government)

Informal/indirect

- industrial personnel engaging in part-time teaching (Industry)
- provision of scholarships, cadetships, research funds, endowments (Industry)
- I.E. statements regarding minimum standards (I.E.)
- activities and status aspirations of other universities and colleges.
- social contact of personnel in each of the actor institutions
- "Community interest".

Some of those in the informal/indirect category also penetrate the subjective freedom barrier.

There is consensus in the universities and colleges that as Government provides finance there is some sort of obligation to be accountable for the activities of these bodies. If they perform their expected roles "properly" there will be no interference with their autonomy.

While one of the direct factors is the provision of manpower for industry, the evidence presented in the last chapter shows that there was consensus that industry did not exert any great influence on university courses (it did exert some on college courses). If in fact it did, (e.g. limits on objective freedom) it was certainly not tangible and not resented.

This contrasts with the position regarding the influence of the Institution of Engineers, Australia. The I.E. has no formal standing in the educational system, although it is debatable whether its interests are presented directly or indirectly. There were conflicting perceptions in academic ranks of the role of the I.E. This has been shown and discussed above and the point that emerges is that when the influence is detected as tangible influence, then it is resented. If it is not detected as tangible, then it is not resented. This strengthens the argument that influence is often intangible, indirect, and not perceived.

Differences were evident also, between university and college respondents. Those in the university were less inclined to admit to non-academic influences than the respondents in the CAE. This is indicative, not only of the actual situation, but of the respondent's perception of his role and the role of his institution.

This is related to perceived status in the various institutions, and also a reflection on Government policy towards universities and colleges in so far as Government, by its policies, has given the institutions a certain level of status.

Those in the university indicated that their status came from their superior position. Some claimed that there should be stringent checks on "lower" institutions and that the attitude towards the university, because of its teaching of intellectually demanding material and pursuing of difficult research tasks, should be one of great deference.

Those in the college of advanced education, on the other hand, catapulted as they had been onto the tertiary scene, were searching for a status. They certainly were not sub-professionals, yet Government's intentions in setting up the CAEs appeared to be to turn out a diplomate - somebody at the "lower" end of the professional spectrum. They were different to the universities and to justify their existence they had to consult with the users of their graduates. They had to give good awards in order to attract good students. Good students would not come unless they would get a professional award. The I.E.Aust. would not give professional recognition unless the course met certain minima regarding length and breadth of courses - the same minima that apply in the universities. The N.S.W.I.T. sought advice from the I.E. and from industry in an attempt to make itself more "useful".

Many in the university resented this, for in the space of a few short years the CAEs, which were set up on shoestring budgets with poor facilities and poor staffing arrangements, were awarding degrees that gave the holder the same professional and occupational status as the university graduate. The point of contention, it appears is the amount of access sought and achieved. Some in the universities looked down on the CAEs because they opened themselves up to the outside world. Those in the CAEs saw this as a virtue, for it justified their role (manifest function) and increased the status of the institution (latent function).

The success of the various actors in presenting and realizing their interests is a reflection of their resources and the successful utilization of these resources.

THE INSTITUTION OF ENGINEERS, AUSTRALIA

The success of the I.E.Aust. derives partly from its strong legal position that was granted by the Conciliation and Arbitration Commission. As a result it has the upper hand in dealing with the educational bodies, for they have, under present conditions, little alternative but to conform to I.E.Aust. decisions.

There is consensus in academic ranks that as I.E. membership gives occupational status, the educational institutions must produce engineers eligible for I.E. membership. There is conflict however over whether this can be described as an infringement of academic freedom.

Literature published by the I.E.Aust. shows that it seeks to influence courses, and evidence presented shows that it is highly successful in doing so. Before the I.E.Aust. determines its policy towards engineering education it must take into account the following factors.

<u>Formal/direct</u>

- requests from universities and colleges to specify entry requirements (universities and colleges)
- Government's expectation that the I.E. will act as a qualifying body - Engineers' Case (Government).

<u>Informal/indirect</u>

- proliferation of courses all seeking professional recognition (universities and colleges)
- industry seeking clear and unambiguous guidelines regarding professional standards (Industry)
- other professional engineers looking to maintain exclusive professional status
- support from a heterogeneous membership
- concern for academic autonomy.

As its main resource the I.E.Aust. has the ability to confer professional status on an engineering qualification. It has a complex organizational structure to carry out its functions. It acts as an accrediting body as well as a learned society and a protective body. As such, it has the support and allegiance of most professional engineers.

The structure of interest articulation relevant to the I.E.Aust. is that of the associational interest group. The channels used are the formal and institutional channels, while the styles are manifest rather than latent and specific rather than diffuse.

The manifest and specific styles are evident in its activity as a qualifying body. Unlike other professional associations Institutions of Engineers have been qualifying bodies from the start and using their standards as a base, have used university degrees as exemption from their own examinations. The universities have always been on the defensive in having to meet professional standards rather than the reverse - the case of an occupation striving to attain university recognition.[1] The university on the defensive has not, generally, led to conflict, as the major actors were individuals who frequently were wearing two hats - one as an academic and the other as an I.E. office-holder and member.

The formal power holders in the educational bodies have encouraged the I.E. but prestigious committees have found they are unable to counter I.E. demands.

The major resources of the I.E. then, are

1. its ability to confer status; and
2. its organizational structure which helps to achieve 1.

GOVERNMENT

Government's major resource generally, is the coercive mechanism of the State, but in this case the major resource is its allocative power in

---

1. An example of an occupational association attempting to attain a university course as a means of conferring status on that occupation was the attempt in 1970 of the Real Estate industry to have a degree course in Real Estate established at Macquarie University, Sydney.

the funding of higher education. By deciding how finances are to be allocated and deciding which developments are to receive support, Government can generally have its interest prevail. In order that Government might pursue its interests of nationalizing expenditure and planning for "useful" future development in education, it must take account of factors that are presented to it formally, through bureaucratic structures, and informally, i.e. act in accordance with its general political and ideological position.

<u>Formal/direct</u>

- submissions of universities to the A.U.C. (universities and colleges)
- submissions of CAEs to the A.C.A.E. (universities and colleges)
- requests for research grants (universities and colleges)
- submissions of I.E. to Committees such as Murray, Martin, Wark, Wiltshire (I.E.)
- submissions of employers and companies to Committees such as the Murray, Martin, Wark and Wiltshire (Industry).

<u>Informal/indirect</u>

- interests of the voter
- the "national interest"
- the taxpayers' interest
- concern for academic autonomy
- political party values.

Government's perception of its role in engineering education will depend very much on its ideological stance - how does it see the future of the nation - what are desirable goals for the future - what investment is necessary for this - whose short-term and whose long-term interests are to be accommodated - is this in accordance with the voters' and taxpayers' interests (if such a thing exists!)? Factors such as these are all important in helping Government determine its position in engineering education.

The structure of interest articulation relevant to Government is that of an institutional interest group. The channels used are the formal and institutional channels while the styles are manifest rather than latent, and diffuse rather than specific.

Government also has a bureaucratic structure to help it perform its tasks rationally and efficiently. If there is variance between the objectives of Government and the objectives of the educational bodies, and if Government can control the actions of the educational bodies by the threat of withholding finance, or more subtly, by letting it be known that only certain projects or developments will receive financial support, then Government is restricting the autonomy of the educational bodies. This is a different position to one in which the educational bodies receive grants and are subsequently accountable for their allocations.

In this way Government operates within (its perception of) the broad range of implicit values of the social system and thus helps set levels of objective freedom. Its financial and allocative power in no real way limits subjective freedom, but sets the limits of objective freedom.

INDUSTRY

Despite its wealth and general economic power, industry finds itself with very few resources in this situation. It employs the graduate, but by the same token it depends on the graduate for its prosperity.

Among engineers in industry there was consensus that the universities and colleges <u>should</u> take note of the interests of industry. There was also consensus on the view that this was not being done at present.

The claims of the critics who argue that universities and colleges uncritically support the values and interests of industry cannot be supported by the respondents' statements. "Industry" does not have a "policy" towards engineering education. Nevertheless there are still interests and expectations communicated in some way. In formulating these interests and expectations the following factors must be taken into account.

<u>Formal/direct</u>

- inservice placement, and ultimate employment of students (universities and colleges, and Government)
- expectation that industrialists will participate in university/college committees (universities and colleges).

<u>Informal/indirect</u>

- expectation of economic growth and stability (Government)
- Proper treatment of professionals (I.E.)
- Social contacts between academics and industry engineers
- Concern for academic autonomy
- Service for "the community".

The interests of industry, when communicated to the educational bodies are not being given the prominence that the respondents say they deserve. Academics at U.N.S.W. and N.S.W.I.T. agree that industry does not influence course details.

While there are great financial resources in industry these generally are not, and cannot, be applied to the educational scene. The only possible area of success is through sponsorship of research and specially endowed chairs in universities, and in these areas in particular there is usually an extra-sensitive approach to autonomy. It is in these areas that there is the realization that autonomy can very easily be compromised, so as a result, there are over-reactions not to compromise it.

Furthermore, industry has no cohesive structure and as such no organizational base from which to operate and present its interests. There is wealth in industry, but the lack of an organizational structure tying industry to education makes for a situation where engineers in industry do not believe that their interests are being adequately considered by the educational bodies. Academics in the bodies studied believe that they are not subject to any real pressure from industry. (Again the issues of objective and subjective freedom can be debated).

The structure of interest articulation relevant to industry would be either that of an institutional interest group or of an associational interest group. Industry does not fit neatly into either category but exhibits characteristics of both. The channels used vary considerably through personal connection, elite representation and the formal and institutional channels. In this case predominant emphasis would be on personal connection. The styles are invariably latent and diffuse.

INTERESTS AND AUTONOMY

The above relates only to interest articulation as it affects the primary target - the university or college - and thus penetration of the first barrier, the objective freedom barrier. It does not relate to the individual academic, and hence the subjective freedom barrier. With regard to the universities and colleges as targets, the predominant structures, channels and styles of interest articulation can be summarized as follows:

	structure	channel	styles
I.E.Aust.	associational interest group	formal and institutional	manifest and specific
Government	institutional interest group	formal and institutional	manifest and diffuse
Industry	associational interest group	personal connection	latent and diffuse

With regard to the individual academic, presentation of interests is less direct and less formal. Institutional and associational interest groups will seldom choose an individual academic as a target. Formal and institutional channels are not appropriate. The most appropriate channel is personal connection and the style may be manifest or latent, specific or diffuse, depending on the circumstances and the individual actors in those circumstances.

Conclusions regarding autonomy are set out under 2. in the following chapter.

SUMMARY

In summary it can be seen that interests are presented to the educational bodies. A variety of structures, channels and styles are used, and generally most penetrate the objective freedom barrier. In fact, it is these interests together, which generally set limits of objective freedom.

The individual academic seldom perceives any direct constraint. He operates, however, within a framework, full control of which is not in his hands. His subjective freedom is not impaired, though the limits of objective freedom are set from a distance.

The situation is a simple political one. Authoritative decisions are made. The "legislative body" is seen as a target, and interests of the other political actors are presented to the "legislative body". Certain individuals within the "legislative body" perform an "executive" function, but in this case most interests are presented to the "legislative", and not the "executive" body.

All of this takes place within a cultural setting, and the "political culture" or prevailing ethos must be understood in order to understand any analysis.

The conclusions are stated in the next chapter.

CHAPTER XI

FINAL CONCLUSIONS

The hypothesis that educational policy in the professions, specifically in engineering, is subject to a wide range of non-academic influences, has been confirmed. It has been shown that while academic considerations certainly are important in curriculum development, other considerations are also important. These considerations include the status aspirations of the professional association, the provision of finance by Government, the perception by Government of the role of technologists in the community, and the attempts by colleges of advanced education to achieve the same professional recognition as universities.

Conclusions that can be drawn from the evidence presented to confirm the hypothesis can be assembled under the following headings:

1. Education and society;
2. Academic autonomy;
3. Policy making in professional engineering education.

1. Education and Society

1.1 It is unrealistic to suggest that educational institutions can remain aloof and isolated from the community in which they exist.

1.2 The educational bodies operate within formal limits set by Government. These limits are made operational through the advice of the Australian Universities Commission, the Australian Commission on Advanced Education, and the New South Wales Advanced Education Board, and the subsequent allocation of finance. In addition, the formal structure of authority within the educational bodies provides for the expression of industrial and governmental interests through visiting and advisory committees.

1.3 In universities and colleges academic freedom (both objective and subjective aspects) is highly valued by policy makers and academics. There is difficulty in reconciling views of autonomy with views of community service.

1.4 Professional bodies seek to organize and qualify professionals, and promote and preserve a high standard of professional conduct. They also strive to raise professional status, and to control entry to the profession.

1.5 The values of Government, which are concerned with socio-industrial development and stability, form the basis for provision and support for a binary system of professional education.

1.6 The interests of industry are not perceived as being directly successful in influencing the educational process, despite encouragement by Government and the higher education authorities. The values of industry that may help structure objective freedom relate to industry's perception of the quality of education and the suitability of the graduate. As employer of the graduate, industry has a strong <u>indirect</u> influence nevertheless, on courses.

1.7 Professional education exists within the social system and supports and is supported by that system, and hence reflects the community's (Government's) expectation that the satisfactory operation of a modern industrial society requires properly trained, competent professionals. Australian higher education, it is argued, is exceptionally utilitarian, and is concerned mostly with producing useful and trained practitioners.

1.8 Engineering courses, like other professional courses, operate within the social settings listed, and are designed in accordance with the prevailing values in the social system. Engineering education helps maintain the socio-industrial status quo. The engineer is trained to fit in with the industrial scene - this is certainly important for the efficient operation of industry, the occupational well being of the graduate, and the stability of the socio-political system.

1.9 Having shown the position of professional engineering education in the social setting, attention must now be focussed on how the various influences are translated into policies in supposedly autonomous institutions.

2. Academic autonomy

2.1 The "ivory tower" view of academic freedom has been rejected. The situation can be analysed in terms of objective and subjective freedom.

Considerable subjective freedom exists within the educational bodies. Once the overall course has been worked out, academics do not feel constrained in the implementation of micro policy or minor course details such as the selection of textbooks or choice of teaching strategies.

2.2 The level of objective freedom is set by the actors who have an interest in professional engineering education. The interests and resources of Government, industry, and the professional association determine the limits within which course determination takes place. <u>Within these limits</u> the academic is relatively free.

2.3 Most of the academic respondents have internalized the values of the Institution of Engineers, Australia, Government, and industry, and this internalization is one of the bases of a strong social control system. Half of the respondents do not regard the interests of these actors as restraints of any sort. The other half, who also operate within the social control system, acknowledge the strength and influence of the non-academic actors. They find, however, that they are permitted to operate freely within the circumscribed limits. While they are aware of the limits, generally they do not think of challenging them.

2.4 Both groups claim to have a high degree of subjective freedom. The former group claims also to have a high degree of objective freedom, and the latter a low degree of objective freedom. The evidence, however, shows that all have a low degree of objective freedom.

2.5 Richard Hofstadter was quoted above (p. 123); "Subjective freedom may exist without objective freedom wherever men are so completely confined by the common assumptions of their place, time or class that they are incapable of engendering any novel or critical ideas that they care to express ... such men would be conscious of no restraints, but they would not be free."

3. Policy Making in Professional Engineering Education

3.1 Formal decisions relating to professional engineering educational policy are made within a formal hierarchy of authority. The governing body at the top of this hierarchy is usually the major academic policy making body in name only. It ratifies decisions taken elsewhere - taken on the basis of interests that are formally and informally, directly and indirectly presented and communicated.

3.2 Both manifest and latent influences operate. There are more latent influences in the university, for the general perception of university autonomy is that manifest influences contravene the notion of autonomy. Formally established committees merely formalize what has often been decided upon informally. The decisions are often based on latent influences that are communicated within the existing social control network.

3.3 Many interests are presented to academics in an indirect and informal manner. Academics generally do not perceive the informal presentation of interests as influences that help determine courses.

3.4 Most academics admitted that non-academic interests affect course determination in the colleges of advanced education, but fewer were willing to state that this was the case in the universities.

3.5 Within the limits set, the academics (who generally do not sit on the governing body) have a considerable amount of power in the policy making process. Their power emanates from their knowledge of the situation and their academic knowledge and expertise, as well as from the legislation regulating the government of higher education institutions. The governing bodies within the formal structure of authority often play a ratificatory rather than an innovatory role. Academic innovation however, operates within explicitly and implicitly circumscribed limits.

This work has shown that non-academic interests bear on course determination in professional engineering education. Although engineering was used for the empirical study, the findings can be generalized to other areas of professional education. The findings relate only to a small area of the professional education system and raise a host of questions in a number of areas in which future research could be undertaken.

Some areas for future research

a) University government - there are many questions in this area, but one of the most interesting relates to University Councils (or Senates). What is the real role of the Council? How does its composition affect its policies? What is the nature of the Council's power?

b) Comparison of course determinants in a professional and a non-professional course - it would be of interest to compare the making of policy for a professional course in an area that is universally recognized to be of great importance to the community e.g. engineering, medicine, dentistry, with that in a course not universally recognized to be of great importance e.g. some of the courses presented in a Faculty of Arts.

c) Student attitudes - it could be hypothesized that there are more students in professional courses in the 1970s who have a lower commitment to professional values and aspirations than there were ten or twenty years ago. If this is so, it would be of interest to study whether this is having any effect on course structure and development.

d) A profession as a pressure group - to what extent can an organized group whose major resource is high professional status, influence public policy?

e) Political values - to what extent can a government's specific party political goals be achieved through influence over and control of the higher education system. Political goals that could be relevant here would be found in the areas of a national science or technology policy, military or defence policy, and also in general economic policy in an industrial society.

APPENDIX A

QUESTIONNAIRE.

Below are a number of statements relating to engineering education. Could you please indicate your feelings about each of these statements by placing an X in the appropriate box.

1. University qualified engineers are overtrained.

   strongly agree ☐ ,agree ☐ ,not sure ☐ ,disagree ☐ ,strongly disagree ☐

2. Views of industry should be considered in planning university engineering courses.

   strongly agree ☐ ,agree ☐ ,not sure ☐ ,disagree ☐ ,strongly disagree ☐

3. Views of industry should be considered in planning College or Institute of Technology engineering courses.

   strongly agree ☐ ,agree ☐ ,not sure ☐ ,disagree ☐ ,strongly disagree ☐

4. Universities are willing to listen to industry's criticism of their engineering courses.

   strongly agree ☐ ,agree ☐ ,not sure ☐ ,disagree ☐ ,strongly disagree ☐

5. Institutes of Technology are willing to listen to industry's criticism of their engineering courses.

   strongly agree ☐ ,agree ☐ ,not sure ☐ ,disagree ☐ ,strongly disagree ☐

6. At present, views of industry are being adequately considered in University engineering courses.

   strongly agree ☐ ,agree ☐ ,not sure ☐ ,disagree ☐ ,strongly disagree ☐

7. At present, views of industry are being adequately considered in Institute of Technology engineering courses.

   strongly agree ☐ ,agree ☐ ,not sure ☐ ,disagree ☐ ,strongly disagree ☐

8. Institutes of Technology serve the profession better than do universities.

   strongly agree ☐ ,agree ☐ ,not sure ☐ ,disagree ☐ ,strongly disagree ☐

9. If you are not satisfied with an engineering course presently being offered by a university, is there any action you could take?

   yes ☐ no ☐

   if yes, please give details ....

   ....

   ....

   ....

10. If you are not satisfied with an engineering course presently being offerec by an Institute of technology, is there any action you could take?

yes ☐ no ☐

if yes, please give details ....

....

....

....

---

11. The Institution of Engineers Australia should co-ordinate all professional engineering education in Australia.

strongly agree ☐, agree ☐, not sure ☐, disagree ☐, strongly disagree ☐

---

12. There are too many academics in important educational policy positions in the I.E.Aust.

strongly agree ☐, agree ☐, not sure ☐, disagree ☐, strongly disagree ☐

---

13. Have you, since graduation, either formally or informally expressed your dissatisfaction with an engineering course? (please write 'yes' or 'no' in each box)

formally ☐ informally ☐ university course ☐ college/institut course ☐

to a professor or head of department ☐ to other academic staff ☐

to a non academic colleague ☐ to the I.E.Aust. ☐

Thank you for your help with the preceding items. It would assist us further if you would now complete the following details.

We assure you that the information contained in the questionnaite will be used for statistical assessment only. Please do not affix your name to the questionnaire.

Age:
- Under 30 ☐
- 30 - 39 ☐
- 40 - 49 ☐
- 50 - 59 ☐
- over 60 ☐

Engineering qualification received:
- In the last 5 years ☐
- 6 - 10 years ago ☐
- 11 - 15 years ago ☐
- 16 - 20 years ago ☐
- 21 - 25 years ago ☐
- over 25 years ago ☐

Are you:

A university graduate ☐ A diplomate ☐ other ☐

Self employed ☐ government employed ☐ employed in private industry ☐

other ☐

MIEAust. ☐ FIEAust ☐

Could you please, in a few words describe the type of engineering activity in which you are primarily engaged.

....

APPENDIX B

AN ENGINEERING EDUCATION TIME CHART

Engineering as an organized educational activity is a relatively recent phenomenon. Below is a very general time chart detailing the development of engineering education.

1747 saw the first ever formal engineering course start in Paris. It was not until the 1820s that courses started elsewhere - 1820s in Germany, 1824 in U.S.A. (Rensselaer Polytechnic Institute New York). 1835 saw the first American academic qualification awarded. The 1860s to the 1880s the first university course in engineering started at Glasgow. Scotland and Ireland led England. 1840 saw Glasgow, 1842 Trinity College Dublin, 1845 Queens University Belfast start engineering courses. 1882 saw engineering education start in England with the establishment of the British Polytechnic (London). 1907 Imperial College was created out of three earlier institutions - The Royal School of Mines (1841), The Royal College of Science (1845) and the City and Guilds of London Institute Engineering College (1884).

Meanwhile in Australia, mechanics institutes were founded in each of the colonies in the 1820s and 1830s, while engineering education started at Melbourne University in 1861. Colleges were set up after this, but it was not until 1879 that a full chair of engineering was created.

Professional bodies grew with the educational bodies. The first was the Institution of Civil Engineers, London, the world's first professional engineering body, 1818. Until the turn of the twentieth century one could qualify as an engineer by being articled to a professional engineer. This may help explain why professional bodies in England predated the educational bodies. 1847 saw the Institution of Mechanical Engineers, Great Britain. 1852 saw the American Society of Civil Engineers, 1893 the American Society for the promotion of Engineering Education (later the American Society of Engineering Education).

In 1870 the Engineering Association of N.S.W. was founded, the first such body in Australia. It arose out of a growing interest in professional standards among engineers in Sydney. In 1919 the

Institution of Engineers, Australia, an amalgamation of ten Australian societies, was formed. In 1967 the Institution of Engineers stipulated that from 1980, all qualifying courses were to be 4 year full time, post matriculation courses. The Institution thus very obviously is in a position to, and does, lay down the standards and boundaries of the profession and the various qualifying processes.

In turning to the development of engineering education in Australia, we see, as mentioned above that mechanics' institutes were founded in the colonies from the 1820s onwards (Hobart 1827, Sydney 1833, Adelaide 1838, Melbourne 1839, Brisbane 1849, Perth 1851, and also in various country centres). These were not vastly successful and were not primarily concerned with the education of professional engineers. In 1861 the University of Melbourne started teaching engineering in the "School of Engineering." The course led to a "Certificate of Engineer". This lasted until 1882, with the initials C.E. later becoming known as "Civil Engineer". During this period the qualification process was haphazard. In a public lecture, W.C. Kernot said one could qualify either by going to an engineering school for "two or three" years, or by being articled to a practicing engineer. The first formal award of an engineering qualification was the "Certificate of Engineer", University of Melbourne, awarded to W.C. Kernot on 7.4.1866. Kernot was later to become Australia's first professor of Engineering.

A second strand was already developing in Victoria. 1869 saw the establishment of the Technological Commission of Victoria. This body was to investigate and organize technical education in the colony. Colleges emerged rapidly in Victoria - 1871 Ballarat School of Mines, 1873 Bendigo School of Mines, 1882 Royal Melbourne Institute of Technology (founded as the Working Men's College, Melbourne), 1887 Gordon Institute of Technology, Geelong.

The University of Melbourne in 1874 amended the regulations for the certificate of engineer to include 12 months of practical experience. This remained so until 1932 when it was deleted to avoid any possible exploitation as a result of the depression. In October 1879 the first Chair of Engineering was established. In November 1882 it was filled, the occupant being W.C. Kernot.

In 1883 Melbourne University introduced a four year course. Sydney at this stage had just commenced a three year course. The first three years of the Melbourne course were identical with the requirements for the B.A. In 1889 the Faculty of Engineering was established at Melbourne. This freed Kernot from the Faculty of Science. The Faculty worked on its own courses and in 1893 the first four year B.C.E. course was commenced. This was quite separate from the Arts and Science faculties, and it is from this, claims Corbett, that today's courses are traceable. Shortly afterwards, degrees of B.E.E. and B.M.E. were instituted. These continued until 1959 when Melbourne University started to award a B.E. bringing it in line with other Australian universities. Monash University started teaching engineering in 1961, producing its first graduate in 1964.

N.S.W. has been somewhat slower than Victoria in the development of engineering education. Most of the resources for engineering education in N.S.W. have been concentrated in the universities and few in colleges. In Victoria, the reverse has been the case.

The University of Sydney was founded in 1850. It had to wait over 30 years for its first engineering courses. Meanwhile in 1878 Sydney Technical College was founded (founded as the Working Men's College, Sydney). In 1880, the Senate of the University of Sydney decided to organize a Faculty of Science with a sub-department of engineering. In 1881 a four year certificate was planned. This was changed in 1884 to a three year degree, the first year of which was to be a common year with Arts. Teaching started in 1883, with W.H. Warren as lecturer. The emphasis was almost completely on Civil Engineering. In 1884 Warren's lectureship was upgraded to a full Chair of Engineering. In 1900 the first four year courses in Electrical and Mechanical Engineering began. By 1910 all engineering courses at Sydney University were four year full time courses. 1920 saw the establishment of the Faculty of Engineering, freeing engineering from the Faculty of Science. All pass courses at Sydney are presently of four years full-time duration. Some honours degrees take five years, either with one extra year at the end (Mechanical) or one year in the middle for which one qualifies for a B.Sc. (Electrical).

Meanwhile the colleges have had an erratic development. In 1878 Sydney Technical College was founded. In 1883 the N.S.W. Board of Technical Education was set up to administer technical education. It was not successful, and in 1889 was incorporated into the Department of Education. In 1895 the S.T.C. awarded its first diploma in engineering. All its courses to this point had been in the evening. In 1902 full time engineering courses were started. Before long, however, day lectures ceased and courses became available only at night. The emphasis in the courses at S.T.C. changed over the years. Lloyd quotes the S.T.C. handbook of 1920, where it claims not to educate to professional levels, and contrasts it with the 1948 handbook where S.T.C. sees its graduates as full professionals (Lloyd, pp. 213-4).

In 1948 teaching commenced at the N.S.W. University of Technology. In 1951 the University took over teaching from S.T.C. for the A.S.T.C. Diploma. In 1951 engineering was commenced at the Newcastle University College (affiliated with the N.S.W.U.T.). In 1965 the University of Newcastle, N.S.W. gained autonomy. In the late 1950s there was concern at

N.S.W.U.T. that it was awarding a technical college diploma (A.S.T.C.). In 1959 the University Council approved the withdrawal of the A.S.T.C. in favour of the B.Sc.(Tech.) - (available only for part-time students). 1959 saw the admission of the last of the diploma students to U.N.S.W. 1960 saw the admission of the first of the B.Sc.(Tech.) students to U.N.S.W. (In 1960 its name changed from the N.S.W. University of Technology to the University of N.S.W.).

The Royal Military College (Duntroon) was founded in 1911. For some time it has been teaching engineering courses. In 1967 it became a part of the University of N.S.W. In 1966 the N.S.W. Institute of Technology was founded.

The University of Adelaide was founded in 1874 but did not commence engineering courses until 1907. Meanwhile the School of Mines and Industries was founded next door to the University in 1889. Co-operation between the university and the School has always been great. Fellowship courses at the School corresponded to B.E. courses at the University. Separate Associateship courses were conducted at the School. This was the case until 1958 when

Associateship courses were replaced by a Bachelor of Technology degree. In 1960 the School was renamed the South Australian Institute of Technology.

The Perth Technical College was founded in 1900. It commenced teaching full time courses for associateship diplomas in mechanical and electrical engineering in 1909. Meanwhile the W.A. School of Mines was founded at Coolgardie in 1902. It moved in 1903 to Kalgoorlie. The University of Western Australia was founded in 1911 and commenced engineering in 1913. In 1925 the Perth Technical College ceased courses in professional engineering in favour of the university, and taught only for part-time sub-professional diplomas. In 1944 Associateship diplomas in Civil, Electrical and Mechanical Engineering were re-introduced. In 1966 the Western Australia Institute of Technology was founded, incorporating the existing colleges.

The University of Tasmania was founded in 1890 and started teaching engineering in 1900. Technical colleges were founded in Hobart and Launceston in 1888 and for some time there were close contacts between the university and the technical colleges. The Tasmanian College of Advanced Education now controls non-university professional courses.

By 1972 there were 28 bodies giving courses that lead to professional engineering qualifications that are recognized by the I.E.Aust. (See Appendix H below for full details).

The Martin Report (1964/5) called for the restructuring of tertiary education, and since 1965 there have been great and rapid changes in tertiary engineering education, especially in the colleges of advanced education. This very general time chart does not take account of most of the post-Martin changes, but has tried to focus on earlier periods.

APPENDIX C

THE INSTITUTION OF ENGINEERS, AUSTRALIA

Minimum Length for Engineering Courses

(Reprinted from the Jan.-Feb., 1967, issue of The Journal of The Institution.)

Following the submission to Parliament of the Report on Tertiary Education in Australia (Martin Report), the Council of The Institution has sought opinions and given consideration to what is the minimum length for an engineering course in which an adequate standard can be attained.

The Council noted that the Martin Report gave strong support to three-year post-matriculation diploma courses in Technical Colleges and that this was endorsed by the Prime Minister in submitting the Report to Parliament. However, it observed that the Martin Report included a sentence stating that " The recognition which should be accorded to them is, of course, a matter for the professional bodies concerned ". (Paragraph 5.82).

From comments and reports received, the Council concluded that, at the present time, courses of three years' duration full time or five years' duration part time after matriculation are sufficiently long to produce professional Engineers of an acceptable standard. However, because of the great advances that are taking place in science and technology, within about a decade three-year courses will not provide adequate time and four years from matriculation will be the absolute minimum required to attain an adequate standard for a professional engineer.

A part-time course will require to be of sufficient duration to attain a similar standard but the Council had difficulty in determining the minimum duration of a part-time course to achieve this standard. It expressed the opinion, however, that a six-year part-time course could be designed to fulfil this requirement provided that the student is engaged in appropriate employment. It will be possible to determine whether six years is adequate only when courses are submitted to The Institution for recognition.

The Council appreciated that there are considerable financial and administrative problems in lengthening courses and that educational authorities must be given adquate time to introduce longer courses. (In this regard it noted that 10 years' formal notice had been given of The Institution's intention not to accept, as from 1st January, 1971, a qualification obtained after that date if it were of less than three years' duration after matriculation for a full-time course or of less than five years' duration after matriculation for a part-time course.)

It thus appears that as four-year courses will be needed in a decade, notice should be given as soon as possible that after June, 1980, The Institution will accept only qualifications obtained after a four-years' full-time course or its part-time equivalent. The four-year full-time courses would then need to be introduced by 1976 and the equivalent part-time courses two or three years earlier.

Bearing in mind the Council's expressed policy that it should not provide examinations as a means of qualifying for the profession and the conclusion that, for the present, three-year full-time courses are adequate, the Council does not consider it desirable, or necessary, for The Institution to set its own examinations for those who have completed three-year courses. It is satisfied that with the long notice that is being given the educational authorities will be able, and prepared, to make the necessary arrangements to meet The Institution's requirements.

The Council therefore announces that as from 30th June, 1980, The Institution will not accept for admission to the Grade of Graduate or of Associate Member, a qualification obtained after that date unless it meets the following requirements.—

1. **A course must be of not less than four years' duration for a full time course after a standard of secondary education not less than the general standard of examination for matriculation to an Australian University.**

2. **A part time course must be of sufficient duration to attain a similar standard as a four-year full time course, after a similar standard of secondary education.**

APPENDIX D

The Institution of Engineers, Australia

Science House, 157 Gloucester Street, Sydney, N.S.W.

BASIC REQUIREMENTS FOR A PROFESSIONAL ENGINEERING COURSE

Consolidation of Various Previous Statements

Approved by the Council of The Institution, 20th March, 1971

The only acceptable method of meeting the initial educational requirements of the engineering profession is that of undertaking an ordered course of study in an engineering school accredited for the purpose.

Such a course should consist of a balanced programme of theoretical and practical activities carried out under supervision and guidance.

The standard of entry should ensure that students are in a position to benefit from a proper treatment of engineering subjects and for this reason the qualification for entrance is set as not less than the completion of normal secondary education.

Course Content

An acceptable engineering course is required to possess both *Breadth* and *Depth* and should be designed to enable the student to apply scientific principles to engineering problems in his chosen branch of engineering.

For these reasons a course is expected to include:

(1) basic scientific and mathematical material appropriate to engineering material included in it;

(2) general engineering science material—not concentrated entirely in one field;

(3) engineering applications material particular to a branch of engineering;

(4) some practical experience relevant to the course, obtained outside the teaching establishment;

(5) professional responsibility material related to the social effects of engineering decisions; and

(6) supporting material, e.g. English, Economics.

The requirement of *Breadth* is considered to imply that about two years of the time spent in the course (but not necessarily the first two) should be devoted to material in categories (1) and (2) above.

The requirement of *Depth* is considered to imply that material appropriate to one substantial engineering discipline, and based on the material in categories (1) and (2) above, should be studied for at least two years in succession and to such a level that the graduate is able to read and benefit from the professional practice papers currently being published.

The purpose of (5) is to show the young engineer his responsibility for the social and economic results of technological decisions by introducing him to the wider implications of engineering in the course of his studies of applications. The field that might be covered is exceptionally wide, and includes relevant aspects of history, sociology, economics, management, legislation, communication, and current affairs, but it is not required that subjects be included in the course under some of these titles.

Course Operation

Such a course should be conducted in an ordered way in an engineering school—either in a University or in a College of Advanced Education.

Provision should be made for *application* activities such as those commonly described as " laboratory work", "case studies", "design work", "project and/or thesis work"—which implies the allowance of time for private study and adequate provision of library facilities and working space. It is expected that the proportion of such activities will increase in the later years of the course.

Course Duration

The developments which are taking place in science and technology and the necessity to provide adequate time for private study, individual effort and meaningful vacation experience are such that within a few years a course (full-time) of four years duration from matriculation will be the absolute minimum required to attain a sufficient standard for a professional engineer.

A part-time course must achieve an equivalent standard. If part-time students are engaged in appropriate employment with day-time release of not less than the equivalent of one day per week, it is probable that six years duration will be satisfactory. However, this will be known for a particular course only when it is submitted to The Institution for accreditation.

The Council of The Institution appreciated that there are considerable financial and administrative problems in lengthening courses and that educational authorities must be given enough time to introduce longer courses. The Council therefore announced early in 1967, and reaffirmed on 20th March, 1971, that as from 30th June, 1980, it would accept for admission to the grade of Graduate or of Member, only those qualifications obtained after that date which meet the following requirements:—

(1) A course must be of not less than four years *duration for a full-time course after a standard* of secondary education not less than the general standard of examination for matriculation to an Australian University.

(2) A part-time course must be of sufficient duration to attain a similar standard as a four-year full-time course, after a similar standard of secondary education.

Engineering School Staff

Those engaged in teaching engineering subjects should possess both academic and professional qualifications, and have had appropriate professional experience. The relative importance of these will be governed by the requirements of the subjects being taught. It is expected, however, that the academic qualifications will be more than the bare minimum implied by having "passed" a subject being taught.

Members of staff are expected to take part in assessing their students, any recognised method being acceptable.

The contact hours required of members of staff should allow them time for such activities as keeping up with their subjects and engaging in engineering research, or investigation, or consulting work.

Flexibility of Courses

None of the above is to be considered as restricting a course to the traditional "Civil", "Electrical", "Mechanical" pattern; it does imply that careful selection of course material is required and that an acceptable course must be designed as a whole and conducted by a competent and experienced staff.

APPENDIX E

THE INSTITUTION OF ENGINEERS, AUSTRALIA

CONDITIONS FOR ACCREDITATION OF COURSES

1. Engineering courses submitted for recognition by The Institution must be so designed that they satisfy the requirements for Entry, Breadth, and Depth, laid down by the Council of The Institution. These requirements are set out in the following statements of policy :
   (*a*) Standard of Entry of an Engineering Course (published in the Jan.-Feb., 1961, issue of The Journal).
   (*b*) Basic Requirements for professional Engineering Courses (published in the Jan.-Feb., 1958, issue of The Journal).

Accreditation of New Courses

2. All requests for recognition of engineering courses for exemption from the Associate Membership Examination must be made on The Institution's form " Request for Review of an Engineering Qualification ". Forms may be obtained from the Secretary of The Institution.

3. The Institution will be prepared to examine proposals for courses and will comment on them if it believes that they are unlikely to receive recognition because they do not conform with the requirements set out in the foregoing statements of policy or for other reasons, e.g. correspondence courses will not be approved.

4. The Institution will be prepared to give provisional recognition to Engineering Courses but only when they have been in existence sufficiently long for some students to have reached the half-way stage in them.

   When the first group of students in a course has reached the half-way stage application may be made for provisional recognition and must be accompanied by the form " Request for Review of an Engineering Qualification ".

   The information supplied will be examined and if necessary an inspection of the establishment will be made, and if the courses appear to be satisfactory provisional approval will be granted. If after an examination of the information supplied and an inspection of the establishment the course is considered unsatisfactory, the short-comings to be rectified before students complete the course will be indicated, and a further application will be necessary.

5. The Institution will be prepared to grant full recognition to a course only when it has been in existence sufficiently long for some students to have completed it.

   When the first group of students has finished the course, it will be necessary for the establishment to submit a further completed form " Request for Review of an Engineering Qualification ".

   The information received will be examined and an inspection of the establishment may be made. If the course is considered satisfactory, full recognition will be granted. If the course is considered unsatisfactory, the shortcomings will be indicated and a time limit set for their rectification. In the meantime provisional recognition may be given and a further application will be necessary at the end of the time limit set.

Courses Currently Accredited.

6. The Institution periodically reviews all Engineering Courses to ensure that those currently accredited, have been maintained at an acceptable standard.

   Should any course be considered not to comply with The Institution's requirements, the course will be placed in the " Provisional " category and the apparent shortcomings will be indicated with a time limit set for their rectification.

   Failure to comply with the indicated requirements within the time specified, may result in withdrawal of accreditation of a course or the educational establishment at which it is conducted.

Students in Courses provisionally recognised.

7. A student who has completed a course which has received provisional recognition and has received his testamur may be considered for admission to the grade of Graduate, provided that his performance justifies it and provided that adequate evidence of his performance is submitted.

Simmons Limited, Glebe, Sydney.

APPENDIX F

THE INSTITUTION OF ENGINEERS, AUSTRALIA

THE ACCREDITATION OF PROFESSIONAL ENGINEERING COURSES

Each engineering course submitted for recognition by The Institution should satisfy the statement of policy published by the Council of The Institution in the March, 1971, issue of The Journal under the title "Basic Requirements for a Professional Engineering Course".

Preliminary Assessment (Proposed New Courses)

Teaching establishments are invited to present details of any proposed new course for preliminary assessment and The Institution will comment on the proposal and state whether or not recognition is likely to be granted.

Provisional Recognition (Developing Courses)

When some students have reached the half-way stage in a new or revised course the teaching establishment should apply for Provisional Recognition.

Full Recognition (Completed Courses)

When some students have completed the course the teaching establishment should apply for Full Recognition.

Details to be Submitted

Four copies of each submission are required, whether for Preliminary Assessment, Provisional Recognition or Full Recognition. Each copy should be a complete separate volume or orderly collection of papers, including the handbook or calendar. (There is no set format for presenting courses to The Institution for accreditation.)

The address for forwarding is:

The Secretary,
The Institution of Engineers, Australia,
157 Gloucester Street,
SYDNEY, N.S.W. 2000.

For **Preliminary Assessment** details are required on the proposed course structure, including outlines of subject syllabuses, estimated intake, academic staff, laboratories and other facilities. The objectives and special features of the course should be stated.

For **Provisional Recognition** the following information is required by The Institution's assessors. (Handbook references may be sufficient for much of the detail.)

1. Letter from authorised representative of teaching establishment.
2. Special features of the course such as the educational philosophy of the teaching establishment, the modus operandi of the department concerned, and the origins and aims of the particular course.
3. Course identification:
   Title of qualification, including branch of engineering.
   Date of introduction of course.
   Date of last revision of course or syllabuses.
4. Entry requirements:
   Normal educational standard for admission.
   Other acceptable methods of admission.
   Normal age of entry.
5. Course arrangement:
   Full-time, part-time, sandwich or combination.
   Duration in years and in hours.
   Number of weeks in each year, excluding examinations.
   Method of progression (year, semester or subject).
   Normal day-time release (for part-time courses).
6. Curriculum:
   If offered by (say) full-time and part-time the difference in curricula should be given.
   Subjects should be arranged with weekly instruction subdivided into lecture and laboratory/tutorial times.
   Subject syllabuses, pre-requisites and recommended texts.
7. Examinations:
   Full set of final examination papers and other assessment material under current syllabus for each stage completed.
   How term examinations, laboratory work, and projects are taken into account.
   Details of any examinations externally set.

8. Academic staff:
   For each member of the academic staff engaged in the technical subjects of the course:
   Name and position or title;
   Academic and professional qualifications;
   Whether engaged full-time or part-time on professional engineering courses;
   Subjects taught;
   Year of appointment;
   Professional and teaching experience;
   Staff/student contact hours per week.
   List of other academic and professional staff servicing the course, and their qualifications.
9. Laboratories and workshops:
   Description of the major items of equipment giving ranges or capacities, approximate value, age and purpose.
   Number of technical officers, laboratory craftsmen and other laboratory personnel.
   Floor areas for each laboratory and workshop.
10. Computing facilities.
11. Library:
    Numbers of and qualifications of staff, and whether full-time or part-time.
    Numbers of books and serial publications relevant to the course.
    Accessions per year.
    Accommodation.
12. Number of students enrolled in each stage:
    Separate listing for full-time, part-time or other arrangement.
13. Industrial experience requirements for students.
14. Commitments for future developments in Items 8–11.
15. Further relevant information.

For **Full Recognition** the application for Provisional Recognition should be brought up-to-date, revised where necessary and added to by giving the examination papers and other assessment material for the later stages of the course. (It may be assumed that The Institution's assessors have retained their copies of the earlier submission.)

Assessment Procedure

The Institution has panels of assessors in each of the following main branches of engineering:

1. Chemical Engineering (including Fuel Engineering).
2. Civil Engineering (including Mining Engineering).
3. Electrical Engineering (including Communication Engineering and Electronic Engineering).
4. Mechanical Engineering (including Aeronautical Engineering, Agricultural Engineering, Industrial Engineering, Production Engineering and Naval Architecture).

Courses which do not fall clearly within any one of these four groups may be considered by appropriate members of more than one panel.

The Institution will normally appoint an inspection committee to report on instructional facilities and other aspects which cannot be considered adequately by remote assessment. The Secretary will arrange a convenient date for inspection after consulting the teaching establishment.

Granting of Recognition

The Institution will determine from the merits of each application for recognition (as amplified by the assessors' and inspectors' reports) whether Provisional Recognition/Full Recognition should be granted.

If, at the Provisional Recognition stage, the course exhibits minor, easily rectifiable deficiencies Provisional Recognition may be granted subject to the teaching establishment overcoming the deficiencies by the time of application for Full Recognition.

If the course does not satisfy The Institution's requirements recognition will not be granted and the reasons for the decision will be given.

Continuity of Recognition

The Institution will from time to time review all engineering courses to ensure that those currently recognised have been maintained at an acceptable standard.

The information required from the teaching establishment then will generally be as listed above for Provisional Recognition (items 1–15).

Courses assessed as satisfactory will continue to receive Full Recognition.

Should a course be found no longer to comply with The Institution's requirements, it may be re-classified as Conditional Recognition, the short-comings indicated and a time set for rectification. Failure to comply with The Institution's requirements may result in withdrawal of recognition.

Enquiries Invited

Representatives of teaching establishments are invited to contact the Secretary of The Institution personally or by letter should any aspect of The Institution's assessment and accreditation procedures need clarifying.

October 21, 1971.

APPENDIX G

TELEPHONES:
*27-5844. *27-8261

TELEGRAPHIC ADDRESS:
ENJOAUST. SYDNEY

The Institution of Engineers, Australia
Science House
Gloucester & Essex Streets
Sydney, N.S.W. 2000

ASSESSMENT OF AN ENGINEERING QUALIFICATION

The form " Request for Review of an Engineering Qualification " sets out the information which is normally required for the assessment of an engineering qualification and for its recognition by The Institution as satisfying its examination requirements. Additional sheets should be added, if necessary, to expand the information presented or to describe special features of the course.

The Council of The Institution may appoint appropriate persons to report on instructional facilities and such other aspects which cannot be covered adequately by the questionnaire.

A separate questionnaire is required for each course to be considered and for each centre offering the course. Where part of a course or individual subjects may be taken at other centres, the information should be subdivided to show the subjects together with the relevant enrolment, staff and laboratory details. Where full-time and part-time courses are offered for the same qualification, **separate** questionnaires are required.

Each completed questionnaire is to be returned to the Secretary of The Institution together with four copies of the current handbook or calendar.

It should be noted that while the Council may approve a qualification on the basis of a particular curriculum, it does not wish to impose rigorous adherence to subject syllabuses. It is expected that syllabuses will be reviewed periodically by the teaching establishment and modified when necessary. However, recognition may be withdrawn where the scope or level of instruction falls below acceptable standards.

C. H. D. HARPER,
Secretary.

CONFIDENTIAL.

REQUEST FOR REVIEW OF AN ENGINEERING QUALIFICATION

The Secretary,
The Institution of Engineers, Australia,
Science House,
157 Gloucester Street,
SYDNEY, N.S.W. 2000.

On behalf of (teaching establishment) ....

I hereby request that the Council of The Institution of Engineers, Australia, consider the qualification which is set out below, as meeting the examination requirements of The Institution.

(Signed) ....

Date .... (Position) ....

1. Course Identification.

Title of qualification (including branch of engineering) ....

Date of introduction of course .... Date of last revision of course or syllabus ....

Class attendance (shown by ×)

Full-time .... Part-time† .... Sandwich-type† .... Combination† ....

†The attendance arrangements are..

....

2. Entry Qualifications.

Normal educational requirement for admission to course ....

....

Maximum exemptions allowable on account of matriculation (where not specified for entry)..

....

Maximum exemptions allowable on account of a certificate course or similar qualification ....

....

Average student age at entry (without exemptions) .... years .... months.

3. Course Arrangement.

(If parallel full-time and part-time or other courses leading to the same qualification are offered, state the nature of the other courses together with major differences in the curricula) ....

....

....

What concessions are made to students transferring from other courses ....

....

....

Is a combination of class attendance in both full-time and part-time courses allowable ....

Length of course (without exemptions) .... years.

Maximum time allowed for completion of course .... years.

Number of weeks of instruction for each academic year, excluding final examination time ....

....

Duration of course (total hours) ....

Method of progression (stage, year or subject basis) ....

(If progression is on complete year or stage basis, state concessions for subjects which may be carried) ....

....

....

A table of pre-requisites is attached.

4. Curriculum.

(Refer to handbook page or add typed sheets.)

Curriculum; handbook reference ....
(Subjects should be arranged in stages or years with weekly instruction subdivided into lecture and laboratory/tutorial time.)

Conversion courses (for holders of certificates or awards under earlier syllabuses); reference ....

Subject syllabuses; handbook reference ....

Recommended texts for each subject; handbook reference ....

5. Examination Procedure.

Four full sets of annual examination papers, under the current syllabus, for each stage of the course are attached.

Subjects examined and assessed externally are ....

....

Are formal term examinations conducted in the majority of technical subjects ....

Where class assignments, term examinations, laboratory work, theses, etc. are taken into account, this is done by ....

....

....

6. Academic Staff.

Attached are four copies of a list of the academic staff responsible for instruction in technical subjects (including the sciences and mathematics), giving the following information for each member of staff:

- Name;
- Position or title;
- Academic and professional qualifications;
- Whether engaged full-time or part-time on professional engineering courses;
- Subjects taught, and course year in which they are given;
- Year of appointment;
- Brief indication of previous experience;
- Total student contact hours per week.

The conditions permitting academic staff to undertake private consulting work are ....

....

7. Laboratories and Workshops.

The major items of equipment in each laboratory associated with the course are listed on separate sheets in the following form.

Name or Description of Laboratory ....

Total floor area .... Date established ....

Item	Max. Range or Capacity	Purpose	Estimated Value

8. Computing Facilities.

The computing facilities (including input and output devices) available to students are ....

....

9. Library.

Qualifications of Librarian-in-charge ....

Number and qualifications of other library staff ....

Full-time ....

Part-time ....

Approximate number of textbooks in this branch of engineering ....

Number of accessions per year for this branch of engineering ....

Number of serial publications for this branch of engineering ....

Maximum number of readers accommodated simultaneously ....

10. Student Statistics.

Number of students enrolled in this and other courses leading to the same qualification:

Stage or Year	Full-time	Part-time	Sandwich	Miscellaneous

Students may be refused permission to continue course if ....

....

Such students may be re-admitted if ....

11. Experience Requirements.

....

....

12. Further Relevant Information.

The Institution of Engineers, Australia

Australian Degrees and Diplomas Recognised by the Institution for the grade of Graduate

April, 1972

AUSTRALIAN CAPITAL TERRITORY

ROYAL MILITARY COLLEGE DUNTROON

Diploma in

Civil Engineering*
Electrical Engineering*
Mechanical Engineering*

*Courses marked with asterisk throughout this list are provisionally recognised.

378.

NEW SOUTH WALES

UNIVERSITY OF NEW SOUTH WALES

(Formerly New South Wales University of Technology)

B.E. in

Aeronautical Engineering
Chemical Engineering
Civil Engineering
Electrical Engineering
Fuel Engineering
Industrial Engineering
Mechanical Engineering
Mining Engineering
Naval Architecture

B.Sc.(Eng.) in

Aeronautical Engineering
Civil Engineering
Electrical Engineering
Industrial Engineering
Mechanical Engineering
Naval Architecture

B.Sc.(Tech.) in

Chemical Engineering
Fuel Engineering
Mining Engineering

Former Courses:

B.Sc. in

Chemical Engineering

B.Sc.(Tech.) in

Aeronautical Engineering
Civil Engineering
Electrical Engineering
Industrial Engineering
Mechanical Engineering
Naval Architecture

NEW SOUTH WALES

UNIVERSITY OF NEWCASTLE

B.E. in

Chemical Engineering
Civil Engineering
Electrical Engineering
Industrial Engineering*
Mechanical Engineering

B.Sc.(Eng.) in

Chemical Engineering
Civil Engineering
Electrical Engineering
Industrial Engineering*
Mechanical Engineering

Former Courses:

B.Sc.(Tech.) in

Chemical Engineering
Civil Engineering
Electrical Engineering
Mechanical Engineering

UNIVERSITY OF SYDNEY

B.E. in

Aeronautical Engineering
Chemical Engineering
Civil Engineering
Electrical Engineering
Mechanical Engineering
Mining Engineering

Former Courses:

B.E. in

Engineering Technology
Mechanical and Electrical Engineering
Mining and Metallurgy

B.Sc. in

Chemical Engineering

379.

NEW SOUTH WALES

NEW SOUTH WALES INSTITUTE OF TECHNOLOGY

)loma in

Civil Engineering*
Electrical Engineering
Electronic Engineering
Mechanical Engineering
Production Engineering
Structural Engineering*

SYDNEY TECHNICAL COLLEGE

mer Courses:

sociateship in

Aeronautical Engineering
Chemical Engineering
Civil Engineering
Electrical Engineering
Local Government Engineering
Mechanical Engineering
Metalliferous Mining Engineering
Naval Architecture
Radio Engineering

QUEENSLAND

JAMES COOK UNIVERSITY OF NORTH QUEENSLAND

B.E. in

Civil Engineering
Electrical Engineering*

UNIVERSITY OF QUEENSLAND

B.E. in

Chemical Engineering
Civil Engineering
Electrical Engineering
Mechanical Engineering
Metallurgical Engineering
Mining Engineering

Former Courses:

B.E. in

Mechanical and Electrical Engineering

B.Sc. in

Engineering

B.Sc.(App. Sc.) in

Industrial Chemistry

QUEENSLAND INSTITUTE OF TECHNOLOGY, BRISBANE

Fellowship in

Civil Engineering*
Electrical Engineering*
Mechanical Engineering*

Associate in

Civil Engineering*
Electrical Engineering*
Mechanical Engineering*

QUEENSLAND

CAPRICORNIA INSTITUTE OF ADVANCED EDUCATION

(Formerly Queensland Institute of Technology, Capricornia)

ellowship in

Electrical Engineering*
Mechanical Engineering*

ssociate in

Electrical Engineering*
Mechanical Engineering*

QUEENSLAND INSTITUTE OF TECHNOLOGY, DARLING DOWNS

ellowship in

Agricultural Engineering*
Civil Engineering*
Electrical Engineering*
Mechanical Engineering*

ssociate in

Civil Engineering*
Electrical Engineering*
Mechanical Engineering*

CENTRAL TECHNICAL COLLEGE, BRISBANE

ormer Courses:

ssociate Diploma in

960 or 1965 syllabus)

Civil Engineering
Electrical Engineering
Mechanical Engineering

lot recognised if course included correspondence studies.)

SOUTH AUSTRALIA

UNIVERSITY OF ADELAIDE

B.E. in

Chemical Engineering
Civil Engineering
Electrical Engineering
Mechanical Engineering

B. Tech. in

Civil Engineering
Electrical Engineering
Electronic Engineering
Mechanical Engineering
Mechanical Engineering (Refrigeration option)

B.Appl.Sc. in

Mineral Engineering

(B. Tech. and B. App. Sc. degrees awarded after courses at South Australian Institute of Technology.)

Former Courses:

B.E. in

Metallurgical and Chemical Engineering
Metallurgy
Mining
Mining Engineering

B.Sc. in

Engineering

SOUTH AUSTRALIA

SOUTH AUSTRALIAN INSTITUTE OF TECHNOLOGY, ADELAIDE

(Formerly South Australian School of Mines and Industries)

Diploma in Technology in

Civil Engineering
Electrical Engineering
Electronic Engineering
Mechanical Engineering
Mineral Engineering

Former Courses:

Fellowship in

Civil Engineering
Electrical Engineering
Mechanical Engineering
Mining
Metallurgy

Associate Diploma in

Civil Engineering
Communication Engineering
Electrical Engineering
Electronic Engineering
Mechanical Engineering
Mechanical Engineering (Refrigeration option)
Mechanical and Electrical Engineering
Mining and Metallurgy
Radio Engineering

SOUTH AUSTRALIAN INSTITUTE OF TECHNOLOGY, WHYALLA

Diploma in Technology in

Electrical Engineering*
Mechanical Engineering*

Former Courses:

Associateship in

Electrical Engineering
Mechanical Engineering

TASMANIA

UNIVERSITY OF TASMANIA

B.E. in

Civil Engineering
Electrical Engineering
Mechanical Engineering

Former Courses:

B.E. in

Chemical Engineering

B.Eng.Sc.

EDUCATION DEPARTMENT OF TASMANIA

Burnie Technical College
Hobart Technical College
Launceston Technical College

Diploma in

Civil Engineering*
Electrical Engineering*
Mechanical Engineering*

Former Courses:

Diploma in
(pre 1965 syllabus)

Civil Engineering
Electrical Engineering
Mechanical Engineering
Structural Engineering

VICTORIA

MONASH UNIVERSITY

B.E. in

Chemical Engineering
Civil Engineering
Electrical Engineering
Mechanical Engineering

UNIVERSITY OF MELBOURNE

B.E. in

Agricultural Engineering (formerly B.Agr.E.)
Chemical Engineering (formerly B.Chem.E.)
Civil Engineering (formerly B.C.E.)
Electrical Engineering (formerly B.E.E.)
Industrial Engineering
Mechanical Engineering (formerly B.Mech.E.)
Metallurgical Engineering (formerly B.Met.E.)
Mining Engineering (formerly B.M.E.)

Former Course:

B.Eng.Sc.

VICTORIA

VICTORIA INSTITUTE OF COLLEGES

Affiliated Colleges offering Engineering Courses:

Ballarat Institute of Advanced Education
Bendigo Institute of Technology
Caulfield Institute of Technology
Footscray Institute of Technology
Gippsland Institute of Advanced Education
Gordon Institute of Technology
Preston Institute of Technology
Royal Melbourne Institute of Technology
Swinburne College of Technology
Warrnambool Institute of Advanced Education

B.Eng. in

Chemical Engineering (Melbourne* only)
Civil Engineering (Melbourne*, Swinburne only)
Communication Engineering (Melbourne only)
Electrical Engineering (Footscray, Gordon, Melbourne only)
Mechanical Engineering (Swinburne only)
Production Engineering (Swinburne only)

BENDIGO INSTITUTE OF TECHNOLOGY

(Formerly Bendigo School of Mines and Industries; Bendigo Technical College)

Diploma in

Civil Engineering
Electrical Engineering
Electronic Engineering
Mechanical Engineering

CAULFIELD INSTITUTE OF TECHNOLOGY

(Formerly Caulfield Technical College)

Diploma in

Civil Engineering
Electrical Engineering
Electronic Engineering
Mechanical Engineering

VICTORIA

FOOTSCRAY INSTITUTE OF TECHNOLOGY

(Formerly Footscray Technical College)

Diploma in

Civil Engineering
Electrical Engineering
Electronic Engineering*
Mechanical Engineering

GIPPSLAND INSTITUTE OF ADVANCED EDUCATION

(Fomerly Yallourn Technical College)

Diploma in

Civil Engineering*
Electrical Engineering*
Mechanical Engineering*

GORDON INSTITUTE OF TECHNOLOGY

Diploma in

Civil Engineering
Electrical Engineering
Mechanical Engineering

PRESTON INSTITUTE OF TECHNOLOGY

(Formerly Preston Technical College)

Diploma in

Civil Engineering
Electrical Engineering
Electronic Engineering
Mechanical Engineering

VICTORIA

ROYAL MELBOURNE INSTITUTE OF TECHNOLOGY

(Formerly Working Men's College; Royal Melbourne Technical College)

Fellowship Diploma of

Aeronautical Engineering*
Chemical Engineering*
Civil Engineering*
Communication Engineering
Electrical Engineering
Electronic Engineering
Mechanical Engineering*
Production Engineering

Associateship Diploma of

Aeronautical Engineering*
Chemical Engineering*
Civil Engineering*
Communication Engineering
Electrical Engineering
Electronic Engineering
Mechanical Engineering*
Mining Engineering*
Production Engineering

(Not recognised if course included correspondence studies.)

Former Courses:

Fellowship Diploma of

(pre 1965 syllabus)

Aeronautical Engineering
Automotive Engineering
Chemical Engineering
Civil Engineering
Communication Engineering
Electrical Engineering
Mechanical Engineering
Mining Engineering

Associateship Diploma of

(pre 1965 syllabus)

Aeronautical Engineering
Civil Engineering
Communication Engineering
Electrical Engineering
Mechanical Engineering
Mining Engineering
Radio Engineering

(Not recognised if course included correspondence studies.)

VICTORIA

SCHOOL OF MINES AND INDUSTRIES, BALLARAT

(Incorporating Ballarat Institute of Advanced Education)

Diploma in

Civil Engineering
Electrical Engineering
Electronic Engineering
Mechanical Engineering
Mining Engineering

SWINBURNE COLLEGE OF TECHNOLOGY

(Formerly Swinburne Technical College)

Diploma in

Chemical Engineering (1965 or later syllabus)
Civil Engineering
Electrical Engineering
Electronic Engineering
Mechanical Engineering
Production Engineering (1965 or later syllabus)

WARRNAMBOOL INSTITUTE OF ADVANCED EDUCATION

(Formerly Warrnambool Technical College)

Diploma in

Civil Engineering*
Mechanical Engineering*

VICTORIA EDUCATION DEPARTMENT

Former Courses:

Diploma in
(pre 1965 syllabus)

Aeronautical Engineering
Civil Engineering
Communication Engineering
Electrical Engineering
Mechanical Engineering
Mining Engineering
Radio Engineering

WESTERN AUSTRALIA

UNIVERSITY OF WESTERN AUSTRALIA

B.E. in

Civil Engineering
Electrical Engineering
Electronic Engineering*
Mechanical Engineering

Former Courses:

B.E. in

Mining Engineering

B.Sc. in

Engineering

WESTERN AUSTRALIAN INSTITUTE OF TECHNOLOGY, PERTH

Associateship in

Civil Engineering*
Mechanical Engineering*
Production Engineering*
Communications Engineering*
Electrical Engineering*
Electronic Engineering*

385.

WESTERN AUSTRALIA

W.A. SCHOOL OF MINES

A BRANCH OF WESTERN AUSTRALIAN INSTITUTE OF TECHNOLOGY

ormer Courses:

ssociateship in

Engineering
Mechanical and Electrical Engineering
Mining

PERTH TECHNICAL COLLEGE

ormer Courses:

ssociateship in

ll-time day course)

Civil Engineering
Civil Engineering (Highway Engineering option)
Communication Engineering
Electrical Engineering
Electronic Engineering
Mechanical Engineering

DEPARTMENTAL EXAMINATIONS

NEW SOUTH WALES	Certificate of Qualification as Local Government Engineer (Civil) (if issued before December 31, 1976, and examinations completed by 1974).
	Local Government Engineer (Electrical) (for syllabus effective from June 1, 1961 only, and if issued before January 1, 1975).
QUEENSLAND	Local Government Engineer's Certificate (if issued before January 1, 1975).
SOUTH AUSTRALIA	Local Government Engineer and Surveyor's Certificate (if issued before January 1, 1975).
VICTORIA	Certificate of Qualification as (if issued before January 1, 1975).
	Engineer of Water Supply
	Municipal Electrical Engineer (for syllabus effective from March 1 1964, only).
	Municipal Engineer

APPENDIX I

HIGHEST EDUCATIONAL QUALIFICATION HELD

	1965 %	1971 %
Diploma	44.2	44.4
University Degree	51.0	46.3
Other	4.8	9.3
	100	100

Adapted from Table 8, Journal of the Institution of Engineers, Australia. Vol. 38(1), Jan./Feb. 1966, p.N5; and Table 5, Ibid., Vol. 44(7-8), July/Aug. 1972, p.22.

APPENDIX J

EMPLOYMENT STATUS

	1965 %	1971 %
Government Employed	60.3	53.4
Privately Employed	35.1	46.2
Self Employed	4.6	
Other		0.4

Adapted from Table 2, Journal of the Institution of Engineers, Australia. Vol. 38(1), 1966, p.N5; and Table 3, Ibid., Vol. 44(7-8), 1972, p.21.

BIBLIOGRAPHY

Official Materials

REPORT OF THE COMMITTEE ON AUSTRALIAN UNIVERSITIES. 1957. Canberra: Government Printer.

REPORT OF THE AUSTRALIAN UNIVERSITIES COMMISSION ON AUSTRALIAN UNIVERSITIES 1958-1963. 1960. Canberra: Government Printer.

FIRST REPORT OF THE COMMITTEE APPOINTED BY THE MINISTER FOR EDUCATION TO INQUIRE INTO VARIOUS ASPECTS OF HIGHER EDUCATION IN N.S.W. 1961. Sydney: Government Printer.

SECOND REPORT OF THE AUSTRALIAN UNIVERSITIES COMMISSION INTO AUSTRALIAN UNIVERSITIES 1961-1966. 1963. Canberra: Government Printer.

TERTIARY EDUCATION IN AUSTRALIA. 1964/5. (3 vols.). Report of the Committee on the future of Tertiary Education in Australia to the A.U.C. Canberra: Government Printer.

FIRST REPORT OF THE COMMONWEALTH ADVISORY COMMITTEE ON ADVANCED EDUCATION. 1966. Canberra: Government Printer.

COMMONWEALTH DEPARTMENT OF EDUCATION AND SCIENCE. (J.G. Gorton). 1966. The Commonwealth Government in Education. Sydney: Halstead Press.

THIRD REPORT OF THE AUSTRALIAN UNIVERSITIES COMMISSION: AUSTRALIAN UNIVERSITIES 1964-1969. 1966. Canberra: Government Printer.

FOURTH REPORT OF THE AUSTRALIAN UNIVERSITIES COMMISSION. 1969. Canberra: Government Printer.

SECOND REPORT OF THE COMMONWEALTH ADVISORY COMMITTEE ON ADVANCED EDUCATION. 1969. Canberra: Government Printer.

REPORT OF THE COMMITTEE OF INQUIRY INTO AWARDS IN COLLEGES OF ADVANCED EDUCATION. 1969. Canberra: Government Printer.

REPORT OF THE NEW SOUTH WALES ADVANCED EDUCATION BOARD FOR 1970. 1971. Sydney: Government Printer.

DEPARTMENT OF EDUCATION AND SCIENCE. 1969. Some Commonwealth Activities in Education. Bulletin, March 1969. Canberra: (mimeograph).

DEPARTMENT OF EDUCATION AND SCIENCE. 1969. Education and the Gross National Product. Canberra: (mimeograph).

DEPARTMENT OF EDUCATION AND SCIENCE. Report for 1969. 1970. Canberra: Government Printer.

DEPARTMENT OF EDUCATION AND SCIENCE. Report for 1970. 1971. Canberra: Government Printer.

EDUCATION IN SOUTH AUSTRALIA. REPORT OF THE COMMITTEE OF ENQUIRY INTO EDUCATION IN SOUTH AUSTRALIA 1969-1970. 1971. Adelaide: Government Printer.

FIFTH REPORT OF THE AUSTRALIAN UNIVERSITIES COMMISSION. 1972. Canberra: Government Printer.

AUSTRALIAN COMMISSION ON ADVANCED EDUCATION. REPORT FOR TRIENNIUM 1973-1975. 1972. Canberra: Government Printer.

DEPARTMENT OF EDUCATION AND SCIENCE. 1972. Facilities for Higher Education in Australia. Bulletin. Canberra.

DEPARTMENT OF EDUCATION AND SCIENCE. 1972. Commonwealth Programmes in Education and Science. Bulletin. Canberra.

DEPARTMENT OF EDUCATION AND SCIENCE. 1972. Report for 1971. Canberra: Government Printer.

DEPARTMENT OF EDUCATION AND SCIENCE. 1972. Commonwealth Expenditure on Education in the States. Bulletin. Canberra.

COMMONWEALTH PARLIAMENTARY DEBATES. (House of Representatives)

COMMONWEALTH PARLIAMENTARY DEBATES. (Senate).

Other Works

AIKEN, H.D. 1966. The American university. New York Review of Books. 7 (6) October 20, 12-17.

ALBROW, M. 1970. Bureaucracy. London: Macmillan.

ALEXANDER, A.E. 1965. University organization and government: a century out of date? Australian Journal of Science. 27, 337-42.

ALMOND, G. 1956. Comparative political systems. Journal of Politics. 18, 391-409.

ALMOND, G. 1960. Introduction: a functional approach to comparative politics. In Almond, G.A. and Coleman, J.S. (Eds.). The Politics of the Developing Areas. Princeton: Princeton University Press.

ALMOND, G. 1965. A developmental approach to political systems. World Politics. 17, 183-214.

ALMOND, G. and POWELL, G.B. 1966. Comparative Politics. Boston and Toronto: Little Brown & Co.

ALMOND, G. and VERBA, S. 1963. The Civic Culture. Princeton: Princeton University Press.

ANDERSON, D.S. and WESTERN, J.S. 1967. Notes on a study of professional socialization. Australian and New Zealand Journal of Sociology. 3, 67-71.

ANDERSON, D.S. and WESTERN, J.S. 1969. Attitudes of students entering professional faculties. Australian Journal of Psychology. 21, 291-299.

ANDERSON, D.S. and WESTERN, J.S. 1970. Social profiles of students in four professions. Quarterly Review of Australian Education. 3(4), 3-28.

ANDERSON, D.S. and WESTERN, J.S. 1972. Professional socialization. In Hunt, F.J. (Ed.). Socialization in Australia. Sydney: Angus and Robertson. 288-306.

ANDERSON, G.L. 1962. Professional education: present status and continuing problems. Yearbook of the National Society for the Study of Education. Chicago. 61 (part II), 3-26.

ANDERSON, G.L. and ERTELL, M.W. 1962. Extra-institutional forces affecting professional education. Yearbook of the National Society for the Study of Education. Chicago. 61 (part II), 235-253.

APTEKAR, H.H. 1971. Constructing and reconstructing the curriculum. In Desai, A.S. and Almanzor, A.C. (Eds.). Curriculum Development and Teaching. Bombay: School of Social Work, University of Bombay, 15-24.

APTER, D.E. 1958. A comparative method for the study of politics. American Journal of Sociology. 64, 221-237.

ASHBY, E. 1967. Anatomy of academic life. Educational Record. 48, 45-50.

ARMSTRONG, S. 1966. Technical education and the professions. In Sanders, C. (Ed.). Technical Education for Development. [Nedlands]: University of Western Australia Press, 217-234.

ARMSTRONG, S. 1970. Another time - another place. Vestes. 13(2), 132-142.

ASHENDEN, D. 1972. Education and democracy. Australian Left Review. 38, 13-18.

ATKINS, R. (Ed.). 1967. University Government: Proceedings of a Seminar held in Canberra, June 1965, under the auspices of the Federation of Australian University Staff Associations. Sydney: F.A.U.S.A.

AUCHMUTY, J.J. 1963. The idea of a university in its Australian setting: a historical survey. The Australian University. 1, 146-70.

AUCHMUTY, J.J. 1972. Commonwealth and state relations in higher education. In Harman, G.S. and Selby-Smith, C. (Eds.). Australian Higher Education. Sydney: Angus and Robertson, 43-54.

AUSTRALIAN COUNCIL FOR EDUCATIONAL RESEARCH. 1964. A Brief Guide to Australian Universities. (4th ed.). Melbourne: A.C.E.R.

AUSTRALIAN VICE-CHANCELLORS COMMITTEE. Report of Proceedings of the Conference of Australian Universities 1961. n.p.d. Distributed by the University Bookroom, University of Melbourne.

AUSTRALIAN VICE-CHANCELLORS COMMITTEE. Chairmans Report on the Years 1967-70. n.p.d.

BACKSTROM, C.H. and HURSH, G.D. 1963. Survey Research. Northwestern University Press.

BALABANIAN, N. 1961. Thoughts on engineering education. I.R.E. Transactions on Education. E4(1), 6-8.

BALABANIAN, N. 1961. A case for a liberal engineering education and a non-professional degree. I.R.E. Transactions on Education. E4(3), 86-91.

BALABANIAN, N. 1968. The essential focus of engineering education - the individual student. I.E.E.E. Transactions on Education. 12(1), 1-3.

BALDRIDGE, J.V. 1971. Power and Conflict in the University: Research in the Sociology of Complex Organizations. New York: John Wiley and Sons.

BALES, R.F. 1950. A set of categories for the analysis of small group interaction. American Sociological Review. 15, 257-63.

BARBER, B. 1963. Some problems in the sociology of the professions. Daedalus. 92, 669-688.

BARNARD, L.H. 1969. Autonomy in the federal context. Vestes. 12(2), 106-113.

BARRACLOUGH, G.W.E. 1964. What does industry expect of the university? University of N.S.W. Symposium on 'The University and Industry'. Kensington, 35-38.

BARRACLOUGH, H.E. 1933. The engineering school in retrospect. Journal I.E.Aust. 5, 309-313.

BARRACLOUGH, H.E. 1936. The engineer in the ages. Journal I.E.Aust. 8, 463-476.

BASSETT, G.W. 1963. Education. In McLeod, A.L. (Ed.). The Pattern of Australian Culture. Ithaca N.Y.: Cornell University Press, 276-312.

BAXTER, J.P. 1957. Education for the nuclear age. Technology. 2(1), 3-5.

BAXTER, J.P. 1964. Relationships between the university and industry in a technological age. University of N.S.W. Symposium on 'The University and Industry'. Kensington, 9-17.

BAXTER, J.P. 1965. Discussion on the Martin Report. Technology, 10 (May), 14-17.

BAXTER, J.P. 1965. A short history of the University of New South Wales to 1964. The Australian University. 3, 74-114.

BAXTER, J.P. 1968. The role of the Vice-Chancellor in the University of N.S.W. The Australian University. 6, 4-13.

BAXTER, J.P. 1968. Problems in the administration of modern universities. The Australian University. 6, 102-121.

BAXTER, J.P., and MYERS, R. 1966. Administration in an Australian University. The Australian University. 4, 95-115.

BECKER, H.S. 1962. The nature of a profession. Yearbook of the National Society for the Study of Education. Chicago. 61 (part II), 27-46.

BELL, D. 1966. The Reforming of General Education. New York and London: Columbia University Press. Chapter 3.

BEN-DAVID, J. 1963-4. Professions in the class system of present day societies. Current Sociology. 12, 247-330.

BENTLEY, A.F. 1908. The Process of Government. Harvard University Press. (Rev.ed. 1967).

BERGER, B.M. 1962. On Talcott Parsons. Commentary. 34, 507-513.

BERTALANFFY, L. von. 1967. General systems theory. In Demerath, N.J. and Peterson, R.A. (Eds.). System, Change and Conflict. New York: The Free Press, 115-129.

BIRRELL, R. 1972. The 'community' and the colleges of advanced education. Australian Journal of Advanced Education. 2(4), 10-17.

BLAKEY, O.F. 1946. Presidential address. Journal I.E.Aust. 18, 37-40.

BLAU, P.M. 1964. Exchange and Power in Social Life. New York: John Wiley and Sons.

BLAU, P.M. and SCOTT, R. 1963. Formal Organizations. A Comparative Approach. London: Routledge and Kegan Paul.

BLAUCH, L. 1955. Education for the Professions. Washington: Department of Health, Education and Welfare, 1-8.

BLAUCH, L. 1959. Accreditation in Higher Education. Washington: Department of Health, Education and Welfare.

BOSKOFF, A. 1950. The systematic sociology of Talcott Parsons. Social Forces. 28, 393-400.

BOWDEN, Lord. 1966. The professional society. Universities Quarterly. 20, 150-157.

BOWEN, N. 1970. Control and direction of Australian colleges of advanced education. In Golding, D.J. et al.(Eds.). Challenges Facing Advanced Education. Melbourne: The Hawthorn Press, 57-64.

BREDEMEIER, H.C. 1955. The methodology of functionalism. American Sociological Review. 20, 173-180.

BREDEMEIER, H.C., and STEPHENSON, R.M. 1965. The Analysis of Social Systems. New York: Holt, Rinehart and Winston.

BRETT, P. 1966. University of Queensland Act. Vestes. 9(2), 77-85.

BRICKMAN, W.W. 1962. Professional education outside the U.S.A. Yearbook of the National Society for the Study of Education. Chicago. 61 (Part II), 68-100.

BROSAN, G. et al. 1971. Patterns and Policies in Higher Education. Harmondsworth: Penguin Books.

BROWN, G.S. 1961. Todays dilemma in engineering education. I.R.E.Transactions on Education. E4(2), 48-50.

BROWN, G.S. 1962. New horizons in engineering education. Daedalus. 91, 341-361.

BROWN, H.J. 1949. Trends in higher technological education and development in New South Wales. Journal I.E.Aust. 21, 141-154.

BROWN, H.J. 1969. Efficient for what? The efficiency of Australian universities. University of New South Wales Symposium 1969. Kensington.

BROWN, R. 1963. Explanation in Social Science. London: Routledge and Kegan Paul, Chapter IX.

BRUBACHER, J.S. 1962. The evolution of professional education. Yearbook of the National Society for the Study of Education. Chicago. 61 (Part II), 47-67.

BUCHER, R., and STRAUSS, A. 1961. Professions in process. American Journal of Sociology. 66, 325-334.

BUTLIN, S.J. 1960. A national approach. Vestes. 3(4), 7-10.

BUCKLEY, W. 1967. Sociology and Modern Systems Theory. Englewood Cliffs, N.J.: Prentice-Hall.

CAIRNS, J.F. 1960. The Government, the A.U.C. and the universities. Vestes. 3(1), 9-13.

CALLAHAN, R.E. 1962. Education and the Cult of Efficiency. Chicago: University of Chicago Press.

CAMPBELL-ALLEN, D. 1969. The Institution of Engineers, Australia. The Engineering Yearbook. Sydney: University of Sydney, 73.

CARR-SAUNDERS, A.M. 1955. Metropolitan conditions and traditional professional relationships. In Fisher, R.M. (Ed.). The Metropolis in Modern Life. New York: Doubleday & Co., 279-288.

CARR-SAUNDERS, A.M. 1966. Professionalization in historical perspective. In Vollmer, H.M. and Mills, D.L. (Eds.). Professionalization. Englewood Cliffs, N.J.: Prentice-Hall, 2-9.

CARR-SAUNDERS, A.M. and WILSON, P.A. 1933. The Professions. Oxford: Oxford University Press.

CATHIE, I. 1967. The Crisis in Australian Education. Melbourne: Cheshire.

CHIN, R. 1966. The utility of systems models and developmental models. In Finkle, J.L. and Gable, R.W. (Eds.). Political Development and Social Change. New York: John Wiley and Sons, 7-19.

CHINOY, E. 1954. Sociological Perspective. New York: Random House.

CHRISTOPHERSON, D.G. 1966. The organization of professional education. Universities Quarterly. 20, 197-205.

CHRISTOPHERSON, D.G. 1967. The Engineer in the University. London: English Universities Press.

CLARK, B.R. 1968. The new university. American Behavioural Scientist. 11(5), 1-5.

CLEGG, W.E. 1945. The education of an engineer as an administrator. Journal I.E.Aust. 17, 173-9.

COGAN, M.L. 1953. Toward a definition of profession. Harvard Education Review. 23(1), 33-50.

COGAN, M.L. 1955. The problem of defining a profession. The Annals of the American Academy of Political and Social Science. 297, 105-111.

COHEN, P.S. 1968. Modern Social Theory. London: Heinemann.

COLEMAN, J.S. 1963. Comment on 'the concept of influence'. Public Opinion Quarterly. 27, 63-82.

CONANT, M.B. 1967. The academic Dean as a subservient bureaucrat. Educational Record. 48, 276-284.

COGALTON, A.A. 1969. Status and Prestige in Australia. Melbourne: Cheshire.

CONNELL, R.W. 1969. On the autonomy of universities - a research student's viewpoint. Vestes. 12(2), 141-149.

CONNELL, W.F. 1959. The development of universities in Australia. The Yearbook of Education. London, 95-107.

COOMBS, P.H. 1968. The World Educational Crisis: A Systems Analysis. New York: Oxford University Press.

COOPER, R.M. 1967. The need for educational change. Educational Record. 48, 248-259.

CORBETT, A.H. 1957. A history of engineering and engineering education in Australia. Australian Journal of Science. 19, 105-116.

CORBETT, A.H. 1961. The first hundred years of Australian engineering education 1861-1961. Journal I.E.Aust. 33, 147-160.

CORBETT, A.H. 1969. Australian engineering 1788-1969. Journal I.E.Aust. 41, 141-147.

CORSON, J.J. 1967. If not the university? Educational Record. 48, 153-157.

CORWIN, R.G. 1967. Education and the sociology of complex organizations. In Hansen, D.A. and Gerstl, J.E. (Eds.), On Education - Sociological Perspectives. New York: John Wiley and Sons, 156-223.

CORWIN, R.G. 1970. Militant professionalism. A Study of Organizational Conflict in High Schools. New York: Appleton, Century Crofts.

COWAN, H.J. 1967. Professional study and specialization in the multiversity. Vestes. 10(2), 83-91.

COWEN, Z. 1969. Autonomy and accountability - a Vice-Chancellor's viewpoint. Vestes. 12(2), 121-126.

COWEN, Z. 1970. Some Thoughts on Australian Universities. Canberra: Royal Institute of Public Administration. (Garran Memorial Oration).

COWEN, Z. 1972. The role and purpose of the university. In Harman, G.S. and Selby-Smith, C. (Eds.). Australian Higher Education. Sydney: Angus and Robertson, 15-28.

CRAWFORD, E.J. 1967. Presidential Address. Journal I.E.Aust. 39, 19-22.

CRAWFORD, J.M. 1938. Presidential Address. Journal I.E.Aust. 10, 218-222.

CRAWFORD, Sir John. 1969. The University and Government. Canberra: Royal Institute of Public Administration. (Garran Memorial Oration).

DAEDALUS. 1963. 92(4). Special issue on the professions.

DAVIDSON, C. 1967. University reform revisited. Educational Record. 48, 5-10.

DAVIE, R. 1971. Engineering education, some American lessons. Australian Journal of Advanced Education. 2(3), 11-14 and 24.

DAVIS, F. 1967. Developing colleges through inter-institutional co-operation. Educational Record. 48, 348-354.

DAVIS, K. 1959. The myth of functional analysis as a special method in sociology and anthropology. American Sociological Review. 24, 757-772.

DEAN, L.R. 1961. The pattern variables: some empirical operations. American Sociological Review. 26, 80-90.

DeGRAZIA, A. 1958. Nature and prospects of political interest groups. Annals of the American Academy of Political and Social Science. 319, 113-122.

DEMERATH, N.J. and PETERSON, R.A. (Eds.). 1967. System, Change and Conflict. New York: The Free Press.

DENZIN, N.K. and METTLIN, C.J. 1968. Incomplete professionalization: the case of pharmacy. Social Forces. 46, 375-381.

DERHAM, D. 1966. The nature of the university and its requirements as affecting education for the professions. University of New South Wales Symposium on the Role of the University in Preparation for the Professions. Kensington, 10-19.

DORE, R.P. 1961. Function and cause. American Sociological Review. 26, 843-853.

DOWLING, R.E. 1960. Pressure group theory: its methodological range. American Political Science Review. 54, 944-955.

DOWSE, R.E. 1966. A functionalist's logic. World Politics. 18, 607-622.

DUBIN, R. 1967. Parsons' actors: continuities in social theory. In Parsons, T. Sociological Theory and Modern Society. New York: The Free Press, 521-536.

DUNN, S.S., FENSHAM, P.J. and STRONG, P.J. 1971. Engineers look back. Australian Journal of Advanced Education. 2(2), 2-6 and 2(3), 15-18.

EASTON, D. 1953. The Political System. New York: Alfred A. Knopf.

EASTON, D. 1957. An approach to the analysis of political systems. World Politics. 9, 383-400.

EASTON, D. 1965. A Framework for Political Analysis. Englewood Cliffs, N.J.: Prentice-Hall.

EASTON, D. 1965. A Systems Analysis of Political Life. New York: John Wiley and Sons.

EASTON, D. (Ed.). 1966. Varieties of Political Theory. Englewood Cliffs, N.J.: Prentice-Hall.

ECKSTEIN, H. 1960. Pressure Group Politics. Stanford: Stanford University Press.

ECKSTEIN, H. 1963. Group theory and the comparative study of pressure groups. In Eckstein, H. and Apter, D.E. (Eds.). Comparative Politics. New York: The Free Press, 389-397.

EDWARDS, A.L. 1957. Techniques of Attitude Scale Construction. New York: Appleton, Century Crofts.

EICHHORN, R.L. The student engineer. In Perrucci, R. and Gerstl, J. (Eds.). The Engineers in the Social System. New York: John Wiley & Sons, 141-159.

ELLIOTT, P. 1972. The Sociology of the Professions. London: Macmillan.

ELVIN, H.L. 1969. Education and political theory. In Selleck, R.J.W. (Ed.). Melbourne Studies in Education.1968-9, 114-128

ENCEL, S. 1963. The Robbins report. Vestes. 6(4), 247-250.

ENCEL, S. 1964. The social implications of the Engineers' Case. Journal of Industrial Relations. 6, 61-66.

ENCEL, S. 1965. Education and politics. Outlook. February, 8-10.

ENCEL, S. 1965. The Martin Report: tertiary colleges. Vestes 8(2), 81-85.

ENCEL, S. 1965. The muffled report. Nation. April 3, 6-8.

ENCEL, S. 1965. Politics and resources for tertiary education. In Tertiary Education in Australia. 31st Summer School of the Australian Institute of Political Science, Canberra, 1965. Sydney: Angus and Robertson, 148-163.

ENCEL, S. 1965. Science, education, and the economy. The Australian University. 3, 54-73.

ENCEL, S. 1965. The social role of higher education. In Wheelwright, E.L. (Ed.). Higher Education in Australia. Melbourne: Cheshire, 1-32.

ENCEL, S. 1966. The nature of the professions and their requirements. University of N.S.W. Symposium on the Role of the University in Preparation for the Professions. Kensington, 6-9.

ENCEL, S. 1967. The University as an Autonomous Institution. Paper presented at the Ninth Conference of the Australasian Political Studies Association, Canberra. (mimeograph).

ETZIONI, A. 1964. Modern Organizations. Englewood Cliffs, N.J.: Prentice-Hall.

ETZIONI, A. 1970. A basis for comparative analysis of complex organizations. In Etzioni, A. (Ed.). A Sociological Reader on Complex Organizations. (2nd ed.). London: Holt, Rinehart and Winston, 59-76.

ETZIONI, A. (Ed.). 1969. The Semi-Professions and their Organization. New York: The Free Press.

EVAN, W.M. 1969. The engineering profession - a cross-cultural analysis. In Perrucci, R. and Gerstl, J. (Eds.). The Engineers and the Social System. New York: John Wiley & Sons, 99-137.

EVERITT, W.L. 1953. Current problems in engineering education. Current Issues in Higher Education. 179-185.

EVERITT, W.L. 1971. Engineering education, an overview. The Encyclopaedia of Education. New York: The Macmillan Company and The Free Press. volume 3, 278-283.

FLANAGAN, W. and FOGELMAN, E. 1967. Functional analysis. In Charlesworth, J.C. (Ed.). Contemporary Political Analysis. New York: The Free Press, 72-85.

FLEXNER, A. 1915. Is social work a profession? School and Society. 1, 901-911.

FLEXNER, A. 1930. Universities, American, English, German. New York: Oxford University Press.

FORBES, A.J. 1960. The Commonwealth Government and the A.U.C. Vestes. 3(1), 15-20.

FOSKETT, J.M. 1955. Social structure and social participation. American Sociological Review. 20, 431-8.

FOWLER, K.T. 1967. University crisis - Australia. New Zealand Monthly Review. 8 (May), 20-21.

FOWLER, R.T. 1961. A history of the School of Chemical Engineering. Technology. 6(December), 67-69.

FRASER, M. 1969. Autonomy and responsibility. Vestes. 12(2), 102-106.

FRASER, M. 1969. The Commonwealth's role in education. Canberra: Department of Education and Science, May 19, 1969. (mimeograph).

FRASER, M. 1969. External Study Facilities and the Relationship of Advanced Colleges to the Universities. Canberra: Department of Education and Science (mimeograph). [Reprinted in the University of Melbourne Gazette 25, (July 14, 1969) 4-9.]

FRASER, M. 1969. Governments, Universities and the Community. Canberra: Department of Education and Science. (mimeograph).

GALBRAITH, J.K. 1971. The New Industrial State. (2nd ed.rev.). Boston: Houghton Mifflin Co. Chapters 25 and 33.

GAMSON, W. 1968. Power and Discontent. Homewood, Ill.: Dorsey.

GEORGE, D.W. 1972. Academic staff structure and university government in Australian universities. Federation of Australian University Staff Associations (51 pp. mimeograph).

GERGEN, K.J. 1968. Assessing the leverage points in the process of policy formation. In Bauer, R.A. and Gergen, K.J. (Eds.). The Study of Policy Formation. New York: The Free Press, 181-203.

GERGEN, K.J. 1968. Methodology in the study of policy formation. In Bauer, R.A. and Gergen, K.J. (Eds.). The Study of Policy Formation. New York: The Free Press, 205-237.

GERSTL, J. and HUTTON, S.P. 1966. Engineers: The Anatomy of a Profession. London: Tavistock Publications.

GIBSON, A.J. 1933. Presidential Address. Journal I.E.Aust. 5, 164.

GOLDING, D.J. et al. (Eds.). 1970. Challenges Facing Advanced Education. Melbourne: The Hawthorn Press.

GOODE, W.J. 1957. Community within a community: the professions. American Sociological Review. 22, 194-200.

GOODE, W.J. 1960. Encroachment, charlatanism, and the emerging profession: psychology, sociology and medicine. American Sociological Review. 25, 902-914.

GOODE, W.J. 1961. The librarian: from occupation to profession? Library Quarterly. 31, 306-320.

GOODE, W.J. 1969. The theoretical limits of professionalization. In Etzioni, A. (Ed.). The Semi-Professions and their Organization. New York: The Free Press, 266-314.

GOODE, W.J. and HATT, P.K. 1952. Methods in Social Research. New York: McGraw-Hill.

GOODGER, E.M. 1966. How respectable is the Faculty of Engineering? The Australian University. 4, 37-43.

GOODMAN, R. 1972. After the Planners. Harmondsworth: Penguin Books, Chapter 5.

GOULDNER, A.W. 1971. The Coming Crisis of Western Sociology. London: Heinemann, Chapters 5-8.

GREENWOOD, E. 1962. Attributes of a profession. In Nosow, S. and Form, W.H. (Eds.). Man, Work and Society. New York: Basic Books, 206-218.

GREGOR, A.J. 1968. Political science and the uses of functional analysis. American Political Science Review. 62, 425-439.

GROSS, A. 1969. On engineering education and engineering students. Journal of Higher Education. 40, 520-533.

GROSS, E. 1968. Universities as organizations: a research approach. American Sociological Review. 33, 518-544.

GROSS, E. 1969. The definition of organizational goals. British Journal of Sociology. 20, 277-294.

HABENSTEIN, R.W. 1963. Critique of 'profession' as a sociological category. Sociological Quarterly. 4, 291-300.

HAGAN, C.B. 1958. The group in political science. In Young, R. (Ed.). Approaches to the Study of Politics. Evantown, Ill.: Northwestern University Press.

HAGGARTY, G.J. 1970. Tertiary education in focus. Vestes. 13(2), 149-155.

HALL, A. 1965. Politics and resources for tertiary education. In Tertiary Education in Australia. 31st Summer School of the Australian Institute of Political Science, Canberra, 1965. Sydney: Angus and Robertson, 132-147.

HALL, A.R. 1965. Supply and demand. In Wheelwright, E.L. (Ed.). Higher Education in Australia. Melbourne: Cheshire, 44-65.

HALSEY, A.H. 1966. The disciplines of professional study. Universities Quarterly. 20, 190-197.

HALSEY, A.H. and TROW, M.A. 1971. The British Academics. London: Faber and Faber.

HARLEY, W.G. 1967. Technology and taxes. Growth. 12, 89-95.

HARMAN, G.S. 1971. Pressure groups and Australian education. Australian Journal of Higher Education. 4(2), 137-147.

HARMAN, G.S. 1972. Pressure group politics in education: a case study. Paper presented to the Sociology of Education Conference, LaTrobe University, November 1972. (mimeograph).

HARMAN, G.S. and SELBY-SMITH, C. (Eds.). 1972. Australian Higher Education. Sydney: Angus and Robertson.

HARPER, C.D.H. 1954. Two definitions of engineering. Journal I.E.Aust. 26, 101-102.

HARRICKS, D.F.J. 1930. Presidential Address. <u>Journal I.E.Aust</u>. 2, 81-89.

HARRIES-JENKINS, G. 1970. Professionals in organizations. In Jackson, J.A. (Ed.). <u>Professions and Professionalization</u>. Cambridge: Cambridge University Press, 51-108.

HARRISON, P.M. 1960. Weber's categories of authority and voluntary associations. <u>American Sociological Review</u>. 25, 232-7.

HASSENGER, R. 1967. A rationale for changing student values. <u>Educational Record</u>. 48, 61-67.

HAWKE, R.J. 1972. The role of the professional in Australian society. <u>University of N.S.W. Letter to Alumni</u>, December, 10-20.

HEATH, H. 1969. Universities - part of the public service. <u>Vestes</u>. 12(2), 113-120.

HENDERSON, A.D. 1969. Control in higher education. <u>Journal of Higher Education</u>. 40, 1-11.

HERMANN, G.D. 1971. Advanced education: a critique of the two Wark Reports. <u>Australian Journal of Higher Education</u>. 4(2), 126-136.

HICKSON, D.J. and THOMAS, M.W. 1969. Professionalization in Britain: a preliminary measurement. <u>Sociology</u>. 3, 37-53.

HIGGINBOTHAM, P.J. 1969. The concept of professional and academic studies in relation to courses in Institutions in higher education (particularly Colleges of Education). <u>British Journal of Educational Studies</u>. 17, 54-65.

HILL, B.V. 1968. The university in Australian tertiary education. <u>The Australian University</u>. 6, 136-156.

HILL, B.V. 1970. Different but equal? An examination of the rationale for a binary system of tertiary education. <u>Vestes</u>. 13(2), 143-149.

HILL, W.W. and FRENCH, W.L. 1966/7. Perceptions of power of a department chairman by professors. <u>Administrative Science Quarterly</u>. 11, 548-574.

HINTON, LORD. 1970. <u>Engineers and Engineering</u>. London: Oxford University Press.

HOFSTADTER, R. 1955. Academic Freedom in the Age of the College. New York. Columbia University Press.

HOLT, R.T. 1967. A proposed structural-functional-framework. In Charlesworth, J.C. Contemporary Political Analysis. New York: The Free Press, 86-107.

HORNE, B.C. 1970. Characteristics and Performance of Second-Year Engineering Students in Victorian Colleges of Advanced Education 1969. Melbourne: Australian Council for Educational Research.

HORNE, B.C. 1970. Social origins of college engineering students. Quarterly Review of Australian Education. 3(4), 29-38.

HORNE, B.C. 1971. Aspects of advanced education. Quarterly Review of Australian Education. 4(1), 2-56.

HORNE, B.C. and WISE, B. 1970. Learning and Teaching in the CAEs 1969. (2 vols.). Melbourne: Australian Council of Education Research.

HOROWITZ, I.L. 1963. Sociology and politics: the myth of functionalism revisited. Journal of Politics. 25, 248-264.

HOWIE, G. 1965. The Martin Report: teacher education. Vestes. 8(2), 103-107.

HUGHES, C.A. 1972. The Murray Report Fifteen Years After. Federation of Australian University Staff Associations. (53 pp. mimeograph).

HUGHES, E.C. 1958. Men and their Work. Glencoe, Ill.: The Free Press.

HUGHES, E.C. 1963. Professions. Daedalus. 92, 655-668.

HUNT, J.W. 1972. The Restless Organization. Sydney: John Wiley & Sons.

HUTTON, S.P. 1965. Educating engineers - an international dilemma. The Chartered Mechanical Engineer. 12, 596-600.

HYAMS, H.H. and SINGER, E. 1968. Readings in Reference Group Theory and Research. New York: The Free Press. 3-27.

INSTITUTION OF ENGINEERS, AUSTRALIA. 1958. How effective is the Institution? What is the policy of Council? Journal I.E.Aust. 30, 331-332.

INSTITUTION OF ENGINEERS, AUSTRALIA. 1959. To raise the status of the profession of engineering. Journal I.E.Aust. 31, N57-58.

INSTITUTION OF ENGINEERS, AUSTRALIA. 1964. Education and employment in engineering. Journal I.E.Aust. 36, N7-9.

JACKSON, J. 1964. The normative regulation of administrative behavior. In Gore, W.J. and Dyson, J.W. (Eds.). The Making of Decisions. New York: The Free Press, 213-241.

JACKSON, J.A. (Ed.). 1970. Professions and Professionalization. Cambridge: Cambridge University Press.

JAHODA, M. 1963. The Education of Technologists. London: Tavistock Publications.

JAMOUS, H. and PELOILLE, B. 1970. Professions or self-perpetuating systems? Changes in the French university-hospital system. In Jackson, J.A. (Ed.). Professions and Professionalization. Cambridge: Cambridge University Press, 109-152.

JENKINSON, H.J. 1935. Some introspective observations on the status of professional engineers. Journal I.E.Aust. 7, 127-133.

JENCKS, C. and RIESMAN, D. 1969. The Academic Revolution. New York: Anchor Books, Doubleday &Co.

JOHNSON, T.A. 1972. Professions and Power. London: Macmillan.

JONES, R.E. 1967. The Functional Analysis of Politics: an Introductory Discussion. London: Routledge and Kegan Paul.

KAPLAN, M. 1967. Systems theory. In Charlesworth, J.C. (Ed.). Contemporary Political Analysis. New York: The Free Press, 150-163.

KAPLAN, M. 1968. Systems theory and political science. Social Research. 35, 30-47.

KATZ, D. and KAHN, R.L. 1969. Common characteristics of open systems. In Emery, F.E. (Ed.). Systems Thinking. Ringwood, Vic.: Penguin Books, 86-104.

KATZ, F.E. 1968. Autonomy and Organization. New York: Random House.

KERR, C. 1963. The Uses of the University. Cambridge: Harvard University Press.

KING, A. 1966. Licensing of professionals. In Vollmer, H. and Mills, D.L. (Eds.). Professionalization. Englewood Cliffs, N.J.: Prentice-Hall, 297-299.

KING, M.D. 1968. Science and the professional dilemma. In Gould, J. (Ed.). Penguin Social Science Survey 1968. Ringwood, Vic.: Penguin Books, 34-73.

KLEINGARTNER, A. 1967. Professionalism and Salaried Worker Organization. University of Wisconsin: Industrial Relations Research Institute.

KOEHLER, W. 1969. Closed and open systems. In Emery, F.E. (Ed.). Systems Thinking. Ringwood, Vic.: Penguin Books, 59-69.

LANDAU, M. 1968. On the use of functional analysis in American political science. Social Research. 35, 48-75.

LANGLANDS, I. 1969. Fifty years of the Institution of Engineers. Journal I.E.Aust. 41, 137-140.

LASKI, H.J. 1935. The decline of the professions. Harper's Magazine. 171, 676-685.

LATHAM, E. 1952. The group basis of politics. Notes for a theory. American Political Science Review. 46, 376-397.

LAVERY, J.A. 1964. Engineering courses in Australian universities - civil engineering. The Australian University. 2, 283-294.

LeBOLD, W.K., HOWLAND, W.E. and McCARTHY, J.L. 1965. Accreditation related to engineering and graduate education: a historical review. Journal of Engineering Education. 55, 175-87.

LEGGATT, T. 1970. Teaching as a profession. In Jackson, J.A. (Ed.). Professions and Professionalization. Cambridge: Cambridge University Press, 153-178.

LESSNOFF, M.H. 1968. Parsons' system problems. The Sociological Review. 16, 185-215.

L'ESTRANGE, W.M.E. 1934. Registration of engineers and other matters. Journal I.E.Aust. 6, 179-180.

LEVY, M.J. 1968. Structural functional analysis. International Encyclopedia of the Social Sciences. New York: Macmillan Company and the Free Press. volume 6, 21-29.

LEWIS, W.P. and BORG, J.J. 1969. Engineering - the profession and the school. Journal I.E.Aust. 41, 45-47.

LINDBLOM, C.E. 1959. The science of 'muddling through'. Public Administration Review. 29, 79-88.

LINDBLOM, C.E. 1968. The Policy Making Process. Englewood Cliffs, N.J.: Prentice-Hall.

LIPSET, S.M. and SCHWARTZ, M.A. 1966. The politics of professionals. In Vollmer, H. and Mills, D.L. (Eds.). Professionalization. Englewood Cliffs, N.J.: Prentice-Hall, 299-310.

LIPSKI, S. 1965. The unknown universities. The Bulletin. 87 (1/5/1965), 19-23.

LITTERER, J.A. 1969. Organizations. (2nd ed.). (2 vols.). New York: John Wiley & Sons.

LIVINGSTON, J.C. 1967. Collective bargaining and professionalism in higher education. Educational Record. 48, 79-88.

LLOYD, B.E. 1968. The Education of Professional Engineers in Australia. (3rd ed.). Melbourne: The Association of Professional Engineers in Australia.

LOCKWOOD, D. 1956. Some remarks on 'the social system'. British Journal of Sociology. 7, 136-146.

LOOMIS, C.P. 1960. Social Systems. Princeton, N.J.: Van Nostrand Co.

LOVEDAY, P. 1962. Group Theory and its Critics. Sydney Studies in Politics (1): Cheshire.

LUNSFORD, T.F. 1968. Authority and ideology in the administered university. American Behavioural Scientist. 11(5), 5-14.

McCAIG, R. 1967. Institutional change in British universities: reactions to social pressures. The Australian University. 5, 65-82.

McCAIG, R. 1970. A new approach to the administration of higher education in Australia. Vestes. 13(2), 115-121.

McCONNELL, T.R., ANDERSON, G.L. and HUNTER, P. 1962. University and professional education. Yearbook of the National Society for the Study of Education. Chicago. 61 (Part II), 254-278.

McGLOTHLIN, W.J. 1960. Patterns of Professional Education. New York: Putnams and Sons.

McGLOTHLIN, W.J. 1961. Insights from one profession that may be applied to education for other professions. Current Issues in Higher Education, 120-123.

McGLOTHLIN, W.J. 1964. The Professional Schools. New York: The Center for Applied Research in Education.

McGLOTHLIN, W.J. 1969. The professions. Journal of Higher Education. 40, 153-156.

MacIVER, R.M. 1953. The social significance of professional ethics. The Annals of the American Academy of Political and Social Science. 297, 118-124.

MacKENZIE, W.J.M. 1966. The ingredients of professionalism. Universities Quarterly. 20, 157-163.

MacKENZIE, W.J.M. 1968. Politics and Social Science. Harmondsworth: Penguin.

McLAREN, J. 1966. Universities, schools and people. Vestes. 9(1), 51-56.

MADGWICK, R.B. 1968. Reflections of a retired Vice-Chancellor. The Australian University. 6, 14-32.

MAGIN, D.J. 1972. Graduates of 1970 Electrical Engineering. University of N.S.W. Research and Development Papers, Tertiary Education Research Centre. (mimeograph).

MARSHALL, T.H. 1965. A recent history of professionalism in relation to social structure and social policy. In Marshall, T.H. (Ed.), Class, Citizenship and Social Development. New York: Anchor Books, Doubleday & Co., 158-179.

MATHESON, J.A.L. 1965. Australian multiversities? The Australian University. 3, 204-224.

MATHESON, J.A.L. 1967. The general framework of university government. In Atkins, R. (Ed.). University Government. Sydney: Federation of Australian University Staff Associations, 10-20.

MATHESON, J.A.L. 1969. The making of a university. Medical Journal of Australia. 1, 791-799.

MARTINDALE, D. 1961. The Nature and Types of Sociological Theory. London: Routledge and Kegan Paul.

MAYHEW, L. 1968. Action theory and action research. Social Problems. 15, 430-432.

MAYHEW, L.B. and FORD, P.J. 1971. Changing the Curriculum. San Francisco: Jossey Bass Inc.

MAZE, W.H. 1961. The implications of the 1960 report of the Australian Universities Commission. Report of Proceedings of the Conference of Australian Universities 1961. Melbourne: University of Melbourne, 13-25.

MECHANIC, D. 1962. Sources of power of lower participants in complex organizations. Administrative Sciences Quarterly. 7, 349-364.

MEEHAN, E.J. 1967. Contemporary Political Thought. Homewood, Ill.: The Dorsey Press, Chapter 3.

MEEHAN, E.J. 1968. Explanation in Social Science. A System Paradigm. Homewood, Ill.: The Dorsey Press.

MENZIES, Sir Robert. 1964. The Universities - Some Queries. Kensington: The University of N.S.W. Inaugural Wallace Wurth Memorial Lecture.

MERTON, R.K. 1959. Social Theory and Social Structure. Glencoe, Ill.: The Free Press, Chapter I.

MILLERSON, G. 1964. The Qualifying Associations. A Study in Professionalization. London: Routledge and Kegan Paul.

MILLETT, J.D. 1962. The Academic Community: An Essay in Organization. New York: McGraw Hill.

MILLETT, J.D. 1967. The ethics of higher education. Educational Record. 48, 11-21.

MILLETT, J.D. 1968. Decision Making and Administration in Higher Education. Kent State University Press.

MILNER, P. and PENGILLEY, C.J. 1972. Technology and Technical Education in Australia - An Introduction. Melbourne: University of Melbourne, Department of Mechanical Engineering. Studies in Technology and Science I.

MITCHELL, A.G. 1968. The role of the Vice-Chancellor. The Australian University. 6, 33-58.

MITCHELL, W.C. 1958. The polity and society: a structural functional analysis. Midwest Journal of Political Science. 2, 403-420.

MITCHELL, W.C. 1967. Sociological Analysis and Politics: The Theories of Talcott Parsons. Englewood Cliffs, N.J.: Prentice-Hall.

MITCHELL, W.C. 1968. Systems analysis: political systems. International Encyclopedia of the Social Sciences. New York: Macmillan Company and The Free Press. volume 15, 473-479.

MOLYNEUX, F. 1970. The Emerging Role of CAEs in the Development of Professional Technical Education in Australia. Swinburne College of Technology Publications. (mimeograph).

MONSON, C.H. 1967. Metaphors for the university. Educational Record. 48, 22-29.

MOORE, W.E. 1967. Economic and professional institutions. In Smelser, N.J. (Ed.). Sociology: An Introduction. New York: John Wiley and Sons, 273-328.

MOORE, W.E. 1970. The Professions: Roles and Rules. New York: Russell Sage Foundation.

MOORHOUSE, C.E. 1955. Training of graduates in engineering works. Journal I.E.Aust. 27, 21-26.

MOORHOUSE, C.E. 1960. Technical and technological education in Australia. Australian Journal of Education. 4, 175-190.

MOORHOUSE, C.E. 1964. Engineering courses in Australian universities - a general survey. The Australian University. 2, 241-256.

MOORHOUSE, C.E. 1964. Engineering courses in Australian universities - electrical engineering. The Australian University. 2, 257-267.

MOORHOUSE, C.E. 1964. Technical and technological education. In Cowan, R.W.T. (Ed.). Education for Australians. Melbourne: Cheshire. 99-120.

MOORHOUSE, C.E. 1966. Undergraduate courses. University of N.S.W. Symposium on the Role of the University in Preparation for the Professions. Kensington, 20-32.

MOORHOUSE, C.E. 1972. Professional education. In Harman, G.S. and Selby-Smith, C. (Eds.). Australian Higher Education. Sydney: Angus and Robertson, 153-168.

MOREY, L. 1961. The State Supported University. Carbondale, Ill.: Southern Illinois University Press.

MURRAY-SMITH, S. 1965. The Martin Report. Vestes. 8(2), 85-89.

MURRAY-SMITH, S. 1965. Technical education in Australia - a historical sketch. In Wheelwright, E.L. (Ed.). Higher Education in Australia. Melbourne: Cheshire, 170-191.

MURRAY-SMITH, S. 1966. Technical education: the lines of development. In Sanders, C. (Ed.). Technical Education for Development. University of Western Australia Press, 1-29.

MURRAY-SMITH, S. 1968. Technical education in Australia 1788-1914. A select bibliography. In Selleck, R.J.W. (Ed.). Melbourne Studies in Education 1967. Melbourne: Melbourne University Press, 210-246.

MURRAY-SMITH, S. 1970. The colleges and the community. In Golding, D.J. et al. (Eds.). Challenges Facing Advanced Education. Melbourne: The Hawthorn Press, 79-89.

NADER, R. 1967. The engineer's professional role: universities, corporations and professional societies. Journal of Engineering Education. 57, 450-454.

NASH, R. 1966. Higher education for the professions. Universities Quarterly. 20, 149-208.

NETTL, P. 1966. The concept of system in political science. Political Studies. 14, 305-338.

NICHOLSON, M.B. and REYNOLDS, P.A. 1967. General systems, the international system and the Eastonian analysis. Political Studies. 15, 12-31.

NIMMO, W.R. 1938. Chairman's address. Brisbane division. I.E.Aust. Journal I.E.Aust. 10, 301-305.

OLESEN, V. and WHITTAKER, E.W. 1970. Critical notes on sociological studies of professional socialization. In Jackson, J.A. (Ed.). Professions and Professionalization. Cambridge University Press. 179-221.

OLIPHANT, M. 1966. University of Queensland Act. Vestes. 9(2), 74-77.

O'NEILL, D. et al. (Eds.). 1970. Up the Right Channels. The University of Queensland. Brisbane.

PARKER, R.S. 1965. Departments and God-professors. Vestes. 8(1), 17-24.

PARSONS, R.W. 1956. The engineer and his education. Journal I.E.Aust. 28, 89-92.

PARSONS, T. 1949. The professions and social structure. In Parsons. Essays in Sociological Theory, Pure and Applied. Glencoe, Ill.: The Free Press. 185-199.

PARSONS, T. 1956. A sociological approach to the theory of organizations. Administrative Science Quarterly. 1, 63-85 and 225-239.

PARSONS, T. 1958. Some highlights of the general theory of action. In Young. R. (Ed.). Approaches to the Study of Politics. London: Stevens and Sons. Atlantic Books, 282-301.

PARSONS, T. 1960. Some ingredients of a general theory of formal organization. In Parsons. Structure and Process in Modern Societies. Glencoe, Ill.: The Free Press, 59-96.

PARSONS, T. 1963. On the concept of influence. Public Opinion Quarterly. 27, 37-62.

PARSONS, T. 1966. The political aspects of social structure and process. In Easton, D. (Ed.). Varieties of Political Theory. Englewood Cliffs, N.J.: Prentice-Hall, 71-112.

PARSONS, T. 1967. A paradigm for the analysis of social systems and change. In Demerath, N.J. and Peterson, R.A. (Eds.). System, Change and Conflict. New York: The Free Press, 189-192.

PARSONS, T. 1967. Pattern variables revisited: a reply to Robert Dubin. In Parsons. Sociological Theory and Modern Society. New York: The Free Press, 192-219.

PARSONS, T. 1968. Professions. The International Encyclopedia of the Social Sciences. New York: The Macmillan Company and The Free Press. volume 12, 536-547.

PARSONS, T. 1968. Systems analysis: social systems. International Encyclopedia of the Social Sciences. New York: Macmillan Company and The Free Press. volume 15, 458-473.

PARSONS, T. and SHILS, E.A. 1951. Towards a General Theory of Action. Cambridge: Harvard University Press, Part II.

PARSONS, T. and SMELSER, N. 1956. Economy and Society. London: Routledge and Kegan Paul.

PARRY-OKEDEN, R.G.C. 1964. What does the university expect of industry? University of N.S.W. Symposium on the University and Industry. Kensington, 49-63.

PARTRIDGE, P.H. 1960/1. The state of our universities. Quadrant. No. 17, 19-26.

PARTRIDGE, P.H. 1962. The university system. In French, E.L. (Ed.). Melbourne Studies in Education 1960-1. Melbourne: Melbourne University Press. 51-71; and The state of the universities, 72-94.

PARTRIDGE, P.H. 1963. Australian universities - some trends and problems. The Australian University. 1, 7-26.

PARTRIDGE, P.H. 1965. Comment on the social role of higher education. In Wheelwright. E.L. (Ed.). Higher Education in Australia. Melbourne: Cheshire, 33-43.

PARTRIDGE, P.H. 1965. The Martin Report. Vestes. 8(2), 71-81.

PARTRIDGE, P.H. 1965. Tertiary education - society and the future. In Tertiary Education in Australia. 31st Summer School of the Australian Institute of Political Science, Canberra 1965. Sydney: Angus and Robertson, 3-30.

PARTRIDGE, P.H. 1968. Society, School and Progress in Australia. London: Pergamon Press.

PARTRIDGE, P.H. 1972: The future of higher education: problems and perspectives. In Harman, G.S. and Selby-Smith, C. (Eds.). Australian Higher Education. Sydney: Angus and Robertson, 169-185.

PERKINS, J.A. 1966. The University in Transition. Princeton, N.J.: Princeton University Press.

PERROW, C. 1961. The analysis of goals in complex organizations. American Sociological Review. 26, 854-866.

PERRUCCI, R. and GERSTL. J.E. (Eds.). 1969. The Engineers and the Social System. New York: John Wiley & Sons.

PERRUCCI, R. and GERSTL, J.E. 1969. Profession without Community. Engineers in American Society. New York: Random House.

PETERSON, R.E. 1968. The student left in American higher education. Daedalus. 97, 293-317.

PHILLIPS, A.E.B. 1970. Colleges of advanced education: in search of identity. The Australian University. 8, 126-151.

PHILP, H. 1970. The piper and the tune - from Murray to the fourth A.U.C. report. The Australian University. 8, 3-33.

PHILP, H., DEBUS, R.L., VIEDEMANIS, V., and CONNELL, W.F. 1964. The University and its Community. Sydney: Ian Novak.

PINNER, F.A. 1963. Notes on method in social and political research. In Polsby, N.W., Dentler, R.A. and Smith, P.A. (Eds.). Politics and Social Life. Boston: Houghton Mifflin Co., 145-163.

PLAYFORD, J. 1968. Big business and the Australian University. Arena. No. 17, 20-30.

PLOWMAN, A.S. 1936. Some aspects of engineering education. Journal I.E.Aust. 8, 349-355.

PRANDY, K. 1965. Professional Employees - A Study of Engineers and Scientists. London: Faber and Faber.

PRESTHUS, R. 1962. The Organizational Society. New York: Random House, Vintage Paperback.

PRYOR, D. 1966. University of Queensland Act. Vestes. 9(2), 85-89.

PUGH, C.D.J. 1970. The social and economic functions of a college of advanced education. Australian Journal of Advanced Education. 1(4), 11-15.

PULLIAS, E.V. 1965. Accreditation in higher education conceived as guidance. College and University. 41, 41-48.

RAPOPORT, A. 1966. Some system approaches to political theory. In Easton, D. (Ed.). Varieties of Political Theory. Englewood Cliffs, N.J.: Prentice-Hall, 129-141.

RAPOPORT, A. 1968. Systems analysis: general systems theory. International Encyclopedia of the Social Sciences. New York: Macmillan Company and The Free Press. volume 15, 452-458.

READ, J. 1969. Some factors influencing autonomy in a faculty of medicine. Vestes. 12(2), 150-157.

RICE, A.K. 1970. The Modern University: A Model Organization. London: Tavistock Publications.

RICHARDSON, S.S. 1972. A role and purpose for colleges of advanced education. In Harman, G.S. and Selby-Smith, C. (Eds.). Australian Higher Education. Sydney: Angus and Robertson, 1-14.

ROBERTSON, R. 1965. The analysis of social and political systems. British Journal of Sociology. 16, 252-258.

ROBINSON, E.E. 1968. The New Polytechnics. Harmondsworth: Penguin.

ROBINSON, E.E. 1970. Challenges facing Australian colleges of advanced education. In Golding, D.J. et al. (Eds.). Challenges Facing Advanced Education. Melbourne: The Hawthorn Press. 13-33.

RODERICK, J.W. 1970. Engineering in broad concept. Journal I.E.Aust. 42, 17-20.

ROETHLISBERGER, F.J. and DICKSON, W.J. 1939. Management and the Worker. Cambridge: Harvard University Press.

ROGERS, W.P. 1966. The function of research in universities. Vestes. 9 (1), 23-27.

ROSTOW, W.W. 1953. Towards a general theory of action. World Politics. 5, 530-554.

ROTHSTEIN, W.G. 1969. Engineers and the functionalist model of professions. In Perrucci, R. and Gerstl, J. (Eds.). The Engineers and the Social System. New York: John Wiley & Sons, 73-98.

RUDNER, R.S. 1966. Philosophy of Social Science. Englewood Cliffs, N.J.: Prentice-Hall, Chapter 5.

RYDER, J.D. 1965. Electrical engineering knows where its going. I.E.E.E. Transactions on Education. E8(2-3), 25-29.

SAMS, J.H. 1971. The engineering profession - licensing and standards. The Encyclopedia of Education. New York: The Macmillan Company and The Free Press. volume 3, 296-300.

SANDERS, C. 1964. The Australian universities. In Cowan, R.W.T. (Ed.). Education for Australians. Melbourne: Cheshire, 121-141.

SANDERS, C. 1966. A comparative review of three reports: Robbins, Martin, Hale. The Australian University. 4, 66-94.

SANDERS, C. (Ed.). 1966. Technical Education for Development. [Nedlands]: University of Western Australia Press.

SCHAEFLER, G.F. and MELTON, L.R.A. [1970]. The CAEs and the Community. A CAE-Based Technical Information Service for Industry. Royal Melbourne Institute of Technology (mimeograph).

SCHEVITZ, J.M. 1971. Two reviews of Perrucci and Gerstl. American Journal of Sociology. 76, 774-6.

SCHOETTLE, E.C.B. 1968. The state of art in policy studies. In Bauer, R.A. and Gergen, K.J. (Eds.). The Study of Policy Formation. New York: The Free Press, 149-179.

SCOTT, W.G. 1969. Organization theory: an overview and an appraisal. In Litterer, J.A. (Ed.). Organizations. Volume 1 (second ed.). New York: John Wiley & Sons, 15-28.

SELDEN, W.K. 1960. Accreditation: A struggle over Standards in Higher Education. New York: Harper.

SELDEN, W.K. 1965. Struggles and tensions in accreditation in higher education. Current Issues in Higher Education. 119-122.

SELZNIK, P. 1943. An approach to a theory of bureaucracy. American Sociological Review. 8, 47-48.

SELZNIK, P. 1948. Foundations of the theory of organization. American Sociological Review. 13, 25-35.

SELZNIK, P. 1961. The social theories of Talcott Parsons. American Sociological Review. 26, 932-935.

SHIVE, J.N. 1963. The creation of new relationships among engineers, educational institutions and professional and technical societies. Current Issues in Higher Education, 143-145.

SHORT, L.N. 1967. Changes in higher education in Australia. The Australian University. 5, 1-41.

SHORT, L.N. 1972. Universities and colleges of advanced education: defining the difference. Federation of Australian University Staff Associations (21 pp. mimeograph).

SILVERMAN, D. 1970. The Theory of Organizations. A Sociological Framework. London: Heinemann.

SIMPKINS, W.S. and BROWNE, R.K. 1970. Australia's system of tertiary education - directions for research. Vestes. 13(2), 162-167.

SIMON, H.A. 1967. The job of a college president. Educational Record. 58, 68-78.

SIMON, H.A. 1970. On the concept of organizational goals. In Etzioni, A. (Ed.). A Sociological Reader on Complex Organizations. London: Holt, Rinehart and Winston, 158-174.

SMITH, G.K. (Ed.). 1965. Pressures and Priorities in Higher Education. Current Issues in Higher Education. Washington: Proceedings of the 20th Annual Conference on Higher Education.

SMITH, H.L. 1962. Contingencies of professional differentiation. In Nosow, S. and Form, W.H. (Eds.). Man, Work, and Society. New York: Basic Books, 219-225.

SNOW, C.P. 1964. The Two Cultures: and a Second Look. Cambridge University Press.

SPIRO, H.J. 1967. An evaluation of systems theory. In Charlesworth, J.C. (Ed.). Contemporary Political Analysis. New York: The Free Press, 164-174.

SPRINGER, G.H. 1967. The systems approach in education. Growth. 12, 95-99.

SPROTT, W.J.H. 1963. Principia sociologica II. British Journal of Sociology. 14, 307-320.

STEPHAN, F.F. and McCARTHY, P.J. 1963. Sampling Opinions: An Analysis of Survey Procedure. New York: John Wiley & Sons.

STOBIE, J.C. 1941. Engineers and education. Journal I.E.Aust. 13, 248-250.

STOUT, A.K. 1969. The basic case for academic self-government. Vestes. 12(2), 126-134.

STRAUSS, G. 1963. Professionalism and occupational associations. Industrial Relations. 2(3), 7-32.

STRETTON, H. 1965. Problems of university expansion. In Wheelwright, E.L. (Ed.). Higher Education in Australia. Melbourne: Cheshire, 75-104.

STRUENING, E.L. and LEHMAN, S. 1969. Authoritarian and prejudiced attitudes of university faculty members. In Perrucci, R. and Gerstl, J.E. (Eds.). The Engineers and the Social System. New York: John Wiley & Sons, 161-199.

SUBLET, F.G.A. 1936. The Institution and engineering education. Journal I.E.Aust. 8, 123-136.

SUTHERLAND, K.L. 1964. Industrial efficiency in Australia. University of N.S.W. Symposium on the University and Industry. Kensington. 28-34.

SWANSON, G.E. 1953. An approach to a general theory of action by Parsons and Shils. American Sociological Review. 18, 125-134.

SWIFT, D.F. 1969. The Sociology of Education. London: Routledge and Kegan Paul.

TEARE, R.B. 1962. Engineering. Yearbook of the National Society for the Study of Education. Chicago. 61. (Part II), 120-139.

TRUMAN, D. 1953. The Governmental Process. New York: Alfred A. Knopf.

TURNER, C. and HODGE, M.N. 1970. Occupations and professions. In Jackson, J.A. Professions and Professionalization. Cambridge: Cambridge University Press, 17-50.

TYLEE, A.F. 1965. Technical and technological education - Victoria. In Wheelwright, E.L. (Ed.). Higher Education in Australia. Melbourne: Cheshire, 215-231.

UNIVERSITY OF CALIFORNIA, BERKELEY, 1968. The Culture of the University: Governance and Education. Report of the Study Commission on University Governance (Convened by Faculty, Senate, and Student Senate): Berkeley.

UNIVERSITY OF NEW ENGLAND TERTIARY AGRICULTURAL PROJECT. 1970. Consensus and Conflict in Tertiary Agricultural Education. Armidale: A report to the C.A.C.A.E. and the Commonwealth Department of Primary Industry.

UNIVERSITY OF SYDNEY PROFESSORIAL BOARD. 1963. Academic administrative structure. The Australian University. 1, 123-134.

VALLENTINE, H.R. 1968. Engineering education and the university. The Australian University. 6, 181-201.

VENABLES, Sir PETER. 1967. The technological universities and education for the professions. Universities Quarterly. 22, 50-67.

VESTES. 1960. The Commission would support wash-basins. Vestes. 3(4), 3-6.

VOLLMER, H.M. and MILLS, D.L. 1966. Professionalization. Englewood Cliffs, N.J.: Prentice-Hall.

WAGNER, H.A. 1955. Principles of professional conduct in engineering. The Annals of the American Academy of Political and Social Science. 297, 46-58.

WALKER, E.A. 1963. Engineers and/or scientists. In Estrin, H.A. (Ed.). Higher Education in Engineering and Science. New York: McGraw-Hill, 30-34.

WALTERS, E.G. 1965. What industry needs in engineers. Journal of Engineering Education. 56, 83-84.

WEINSTEIN, L. 1962. The group approach: Arthur F. Bentley. In Storing, H.J. (Ed.). Essays on the Scientific Study of Politics. New York: Holt, Rinehart and Winston.

WESTERN, J.S. and ANDERSON, D.S. 1968. Education and professional socialization. Australian and New Zealand Journal of Sociology. 4, 91-106.

WHEELER, D.K. 1970. Barriers to educational change in Australian universities. Vestes. 13(3), 246-257.

WHEELWRIGHT, E.L. (Ed.). 1965. Higher Education in Australia. Melbourne: Cheshire.

WHITE, D. 1972. Education and capitalism. In Playford, J. and Kirsner, D. (Eds.). Australian Capitalism. Ringwood, Victoria: Penguin Books, 219-247.

WILENSKY, H.L. 1964. The professionalization of everyone? The American Journal of Sociology. 70, 137-158.

WILLIAMS, B. 1970. A functional differentiation? Vestes. 13(2), 121-125.

WILLIAMS, B. 1972. Values and organization in universities. Quadrant. No. 77, 4-12.

WILLIAMS, H.S. 1963. Tertiary technical education in Australia. The Australian University. 1, 89-119.

WILLIAMS, H.S. 1966. The Martin Report and after. The Australian Journal of Higher Education. 2, 252-260.

WILLIAMS, H.S. 1970. Underlying assumptions of tertiary education in Australia. In Golding, D.J. et al. (Eds.). Challenges Facing Advanced Education. Melbourne: The Hawthorn Press. 35-49.

WILLIS, A.H. 1963. The unsteady state of engineering education. Journal I.E.Aust. 35, 57-62.

WILLIS, A.H. 1964. Engineering courses in Australia - mechanical engineering. The Australian University. 2, 268-282.

WILLIS, A.H. 1966. Graduate courses. University of N.S.W. Symposium on the Role of the University in the Preparation for Professions. Kensington, 33-43.

WISEMAN, H.V. 1966. Political Systems. London: Routledge and Kegan Paul.

WOLIN, S.S. and SCHAAR, J.H. 1965. Berkeley and the fate of the multiversity. New York Review of Books. March 11, 15-18.

WOOD, J.F.D. 1964. How many levels of engineering training do we need? Journal I.E.Aust. 36, 219-224.

WOOD, J.F.D. 1965. Technical and technological education - N.S.W. In Wheelwright, E.L. (Ed.). Higher Education in Australia. Melbourne: Cheshire, 192-214.

WOOD, J.F.D. 1969. Institutes and colleges of advanced education. The Australian Journal of Education. 13, 257-269.

WOOD, J.F.D. 1970. Tertiary education at two levels. Background to Australia's binary system of tertiary education. Vestes. 13(2), 100-115.

WOOTTON, G. 1970. Interest Groups. Englewood Cliffs, N.J.: Prentice-Hall.

YOUNG, O.R. 1964. The impact of general systems theory on political science. General Systems. (Yearbook of the Society of General Systems Research). IX, 239-253.

YOUNG, O.R. 1968. Systems of Political Science. Englewood Cliffs, N.J.: Prentice-Hall.

YOUNG, P.V. and SCHMID, C.F. 1966. Scientific Social Surveys and Research. Englewood Cliffs, N.J.: Prentice-Hall.

(ANON.). 1956. The School of Civil Engineering. Technology. 1 (December), 49-54.

(ANON.). 1958. History of the School of Mining Engineering and Applied Geology. Technology. 3 (May), 3-6.

(ANON.). 1958. History of the School of Mechanical Engineering. Technology. 3 (August), 35-41.

(ANON.). 1958. The Murray Report on Australian universities. Current Affairs Bulletin. 21(11), 163-176.

(ANON.). 1967. The university student '67. Current Affairs Bulletin. 39(8), 115-127.

(ANON.). 1971. But are you REALLY a professional? Professional Engineer. 25(4), 39-42.