CHAPTER 1

INTRODUCTION

In the changing times we do need to ensure a new intellectual thrust to surveying education replaces the narrowness of traditional mono-disciplinary surveying education often demanded by surveying practitioners.

(Hoogsteden & Williamson, 1991: 324)

Australia is producing highly trained technicians who are under educated in the broader sense of the term.

(Preston, 1991: 57)

No-one now seriously questions the increasing use and importance of digital data and electronic computer technology leading to increased efficiency with multi-disciplinary involvement lessening the relative importance of specialised skills and knowledge and further blurring traditional work boundaries.

(Hocking, 1990: 1)

... competency in spatial issues is as important to life and vocational skills as is literacy and numeracy.

(Granger, 1992: 8)

All industry education should be available throughout the State without penalty.

(Davies, 1991: 6)

Failure to offer a full external degree ... continues to discriminate against potential students resident outside south-east Queensland...

(ACSQ, 1991: 2)

I believe that the main failure of Surveyors and the surveying industry has been an inability to take advantage of the opportunities that the new technologies have presented.

(Dwyer, 1995: 98)

... efforts to bring the teaching of our various guilds in one single discipline which embraces all facets, is getting more intensive.

(Ormeling, 1993: 115)

1.1 Outline of the study.

The above statements suggest the need of the surveying and mapping industry to exploit available technological opportunities in developing the profession and professionals for the 21st Century. The multidisciplinary professional who is more educated than trained, will best serve the needs of society and his/her own betterment. This thrust outlines the central

theme of this study, which is concerned with identifying the educational needs and opportunities in Australia that do not maximise links amongst employers, higher education institutions and professional organisations. The findings are needed to encourage a cohesive, integrated and co-operative approach to professional education that addresses the human resource needs of the entire industry. This educational philosophy is not just the gaining of knowledge, but preparation for the creation of knowledge, and about broadening minds through any form of equitable access. To assist in solving the perceived contemporary and future needs, an industrial relevant curriculum philosophy will be investigated.

The purpose and scope of this study is detailed in 1.4 Research Objectives.

1.2 Introduction.

In recounting the history of surveying in Australia, Hannigan (1990a: 209), Davies, (1991: 2), McKnoulty and Dunlop (1992: 1) and Williamson (1981: 294) describe the fragmentation of the surveying discipline into cartography, town planning, valuation etc. and the formation of their respective professional bodies. Davies (1991: 2) believes similar trends and the loss of discipline elements are again occurring through the apathy towards embracing the spatial information systems opportunities. With the advent of automation and geographic information systems, professional bodies such as the Institution of Surveyors and the Association of Consulting Surveyors, individual professionals and academics have begun to re-examine their roles in the whole spatial information industry. They are calling for new education models to reunite the current industry and to reflect the needs of this industry and its future direction (refer to 2.3.1).

Neither society nor the professions are immune to change: it is inevitable and rarely a passing phase to be ignored. Change is generally initiated to reflect specific needs or demands and be for the benefit of society in general. Technological advancements, especially in the electronics communications arena, have enabled society to be more aware, demand more and expect developments to occur to ensure their needs are met.

Information, perceived by society as the primary and highest value commodity in the market place (Baker & McLaughlin, 1991: 1), is increasingly in demand in relevance, quality, quantity and speed of delivery. The spatial information portion of the information industry is then under enormous pressure to provide base information to a wide variety of professional clients, and the public in general, with methodologies and performances matching current systems and quality levels. Hence, these increased societal demands include professional and economic accountability, quality assurance and a myriad of different thematic products that satisfy their needs, placing the onus on the professionals to understand the needs and to adopt and adapt to changes.

The impact of technology automation and sophisticated communication techniques in the spatial information industry has also meant greater ease in performing traditional tasks, an increased blurring of traditional work boundaries, and increased technical and academic

levels of operation (Cameron & Williams, 1989: 828; Gagnon & Coleman, 1990: 380; Hannigan,1990a: 225; and Trinder, 1990: 1). The spatial information industry is now being viewed as a single entity that encompasses all of the professional activities (spatial data acquisition and management) that have been previously regarded a discrete sub-cultures, eg. surveying, cartography, remote sensing, geographic information systems, etc. (Bedard *et al.*, 1988: 111; Gagnon & Coleman, 1990: 378; Gracie, 1989: 259; Groot, 1991: 367 and Task Force, 1991: 17). This integrated single dynamic and flexible industry is perceived as the only way of acquiescing to societal needs. Members of such a structure will be deemed to have a common and broad education to enable an understanding and integrated and contextualised approach to problems and their management. They will also have gained perceptions and understanding of the needs of society. Amalgamation of the various professional bodies into a single organisation, or even the collection of the separate bodies under an umbrella organisation, is also considered necessary for the viable future of the whole industry. The latter has occurred in Canada, with the formation of the Geomatics Industry Association of Canada in 1987, as it was considered to more aptly reflect the industry's amalgamation trends and *modus operandi* (Coleman & McLaughlin, 1988: 23, Gagnon & Coleman, 1990: 378 and Lodwick and Wright, 1993: 297).

The concepts for this thesis developed following the author's' perception that Australian education and training courses for professionals, associated with the various disciplines in the surveying and mapping (spatial information) industry, have not taken up the challenge offered by the Commonwealth White and Green papers on higher education (Dawkins, 1988) to maximise the links amongst employers, institutions of higher education and professional organisations. The planned 'modernisations' and more effective use of resources were aimed at being compatible with contemporary and future societal needs and in order to develop the governments 'clever country' concepts. These concepts, coupled with a National qualifications nomenclature and a National accreditation organisation involving industry, academic and professional organisation representation, were to enhance educational and work articulation, credit transferring, economic viability and the learning appropriate for the current and future needs of the Nation.

Open access learning, and particularly the distance education segment, was also a major government objective and has been increasingly referred to in the surveying and mapping disciplines' literature and educational literature (ACSQ, 1991: 3; Coldeway, 1988: 44; Davies 1991: 6; Hannigan, 1988: 185; Johnson, 1990: 1 and Taylor, 1991: 10). Any curriculum model reflecting these philosophies would incorporate flexible admission and topic choice, various modes of study and mobility between them. It would also maintain the same educational opportunity and structure for the full or part time student and the more disadvantaged distance education student.

The integration of technologies, the changes in technical practices and societal demands in the various spatial information disciplines, all call for a new curriculum model to meet the needs of educating and training future professionals; to reunite the industry; and to reflect the needs of that current industry and its future direction. The difficulty is in not knowing what expertise is required for the future. If the right construct is not ascertained, then

societal needs will not be served. Some changes have occurred in an endeavour to reflect the changing industry, but it is apparent that a fully integrated multidisciplinary open access curriculum, not separate surveying and cartography courses, is the method of satisfying contemporary and future client demands and to enable industry to achieve a cohesive whole for the betterment of society in general.

1.3 The Problem.

Despite national and international calls for changes in practices and subsequent educational philosophy within the spatial information industry (refer to 2.3 and 2.4), the variety of Australian educational models appear to still support an equipment orientation and 'yesterday's' philosophies. These philosophies place a greater emphasis on mensuration than on land management. To date, within Australia, there has not been any comprehensive investigation on the perceptions of the range of expectations by employers, or relevant professional organisations, from professionals courses in the modern and future spatial information environments. It appears that the industry is equipment and discrete specific applications driven. However, there are calls for fresh, articulate, innovative and capable young graduates able to respond to new challenges, not those practices based on philosophies of twenty years ago. In developing this new philosophy, it is acknowledged and envisaged that to adopt it, initiate it and evaluate the new professional graduate, the full impact of theses changes will not occur until a minimum of fifteen years into the future. It is also expected that new curricula principles may initially appear radical and meet with some resistance, even though they have been founded on sound conceptualised evidence.

The current educational models have been built up over the last seventy years with some changes in structure in the last ten years. Generally, the various curricula follow a largely unchanged on-campus studies structure but with some increase in education at the expense of training. Following the CTEC study (Lyons, 1984), phase one of educational articulation and credit transfer arrangements between TAFE (Queensland), USQ, QUT and the U of Q effectively commenced in 1986. The USQ has maintained and further developed the articulation philosophy with an end-on educational structure and including a concurrent and equitable off-campus study structure. In 1989 the University of Melbourne introduced, into its spatial information undergraduate programme, some new subjects and three study streams, effectively offering alternative majors into a five year double degree structure (Leahy & Williamson, 1991: 8). Curtin University has addressed the perceived needs of spatial information industry by forming surveying and cartography stands with a large commonality of subject areas (Curtin University course information brochures), similar to the RMIT course opportunities but more flexible. Other similar recent changes are discussed in greater detail in section 2.4.

Recent governments have required educational institutions to address a planned 'modernising' and more effective use of resources through a broader curriculum, common first years, student access and equity improvements, the establishment of bridging courses and other training programmes. These developments were seen as necessary to enhance and facilitate credit transferring and established articulation and credit transfer arrangements. The

universities are expected to mostly concentrate on education, with the TAFE sector concentrating on skills or vocational training, with an increased level of 'general' studies (eg. Asian Studies) to be introduced into professional courses (Dawkins, 1988: 18). These concepts, coupled with a National qualifications nomenclature and a National accreditation organisation involving industry, academic and professional organisation representation (Dawkins, 1988: 30), are to enhance articulation, credit transferring, economic viability and the learning appropriate for the current and future needs of the Nation. Achieving these objectives and presenting material in a more synergistic form to reflect industry practices will require significant changes in professional curriculum concepts and makeup. These changes can only be effective if based on industry wide long-term needs. No substantive investigations have been conducted on courses' delivery efficiency to accommodate emerging professional requirements or equity and access and social justice to the variety of prospective students (Davies, 1991: 6; Dawkins, 1988: 54; Hannigan, 1992b: 428).

In Canada and the USA it is believed a fully integrated multidisciplinary curriculum, not separate surveying and cartography courses, is the method of satisfying contemporary and future demands, to enable industry to achieve a cohesive whole and to adopt, adapt and fully utilise technological advances for the benefit of society (Groot, 1991: 368 and McLaughlin *et al.*, 1991: 15). To enable the modern professional to function effectively in society, there have been calls for the inclusion [some has occurred] of more social sciences and humanities subjects (especially communication and leadership skills, law, mathematics, physics and environmental studies) into the professional courses at the expense of areas such as geodesy, astronomy, etc.

Other specific occurrences that can be facilitated or assisted by a change to current curriculum philosophy, and which will be addressed in chapter 2, are;

(i) Professional institution amalgamation.
(ii) Industry self regulation and economic accountability.
(iii) Paraprofessional and professional responsibilities delineation.
(iv) Professional accountability.
(v) Quality assurance.
(vi) Economic viability of the industry.
(vii) Competency based education and training procedures.
(viii) Educational and work place articulation.
(ix) National open access education requirements.
(x) Increased industry involvement in education and training.
(xi) Resource sharing needs.
(xii) Increased division between the provision of education and training.

1.4 Research Objectives.

The construct of this research comprised of identifying the problems, trends and needs in the various surveying and mapping professional cultures and perceived curricula deficiencies in providing for those needs

The aim of this research was then to determined the essential qualities of a beginning professional in geomatics in the 21st Century that would address these needs of the Australian industry. This would then establish new industry relevant educational model principles for a multidisciplinary curriculum to be formed and solve the existing and perceived emerging suite of problems (refer to 2.4) via a 'multidisciplinary focus' professional graduate. The model is delimited to the specific approach of undergraduate studies, relegating detailed issue of post graduate studies, specific continuing education and professional development as beyond the scope of this study. In establishing the perceived suite of relevant problems there will be a literature review and stakeholder interviews, before developing a needs based curriculum structure principles and considering the resulting implications. A curriculum developed from these principles is expected to educate beginning geomatics' professionals (defined in 2.2.1 and Appendix 1).

Specifically, the research methodology is divided into four subparts, the first two being essentially literature based. The third stage will be the interviewing and analysis of specific stakeholders' experiences of geomatics, while the last will determine curriculum structure principles and their implications. Those subparts are:

(a) Define geomatics and ascertain, in view of the established curriculum models in Australia, if the conceptualised new model philosophy is proposing new concepts and principles.

(b) Review relevant Australian and overseas literature relating to the contemporary structure of the industry, the efforts to initiate changes to accommodate technological changes, societal requirements for spatial information, and educational trends. Within this context the literature review will be grouped into the following areas:
   (i) Industry related literature from academics, professionals, paraprofessionals, and professional organisations; policy documents; and related literature on 'peripheral' areas of law, land-management, management, economics, etc.
   (ii) The impact of technology hardware and the related processes and organisation.
   (iii) Educational issues relating to curriculum, open access philosophies and strategies contained within government policy documents.
   (iv) Spatial information needs

(c) Review the processes of the most appropriate available research methodology (phenomenography) for determining people's perceptions of need and not simply statements of need.

(d) Clarify research questions that are compatible with a phenomenographic research approach. Interviews will then be conducted with a variety of stakeholders identified during stage 2 (b. above), followed by the preparation of the transcripts and the analysis. Data from the analysis will be used in the process of developing open access geomatics' curriculum structure and principles, with supporting references from the literature review, the implications of those curriculum principles.

1.5 Conclusions: Chapter 1.

This thesis aims to identify educational needs and opportunities that exist between employers, higher education institutions and professional organisations. Suggested links provide a professional education which incorporated a cohesive, integrated and co-operative approach. Existing and emerging problems indicated that changes were necessary to reunite the industry and reflect the requirements of the current industry and its future direction. They also addressed the industry's human resource needs and provided a philosophy relevant to the industry, the curriculum, and open access education.

The research is expected to result in a curriculum structure which reflects the geomatics' human resource needs for the next century. The curricular principles will provide the essential qualities of a beginning professional. As the geomatics' industry *modus operandi* and curriculum are highly interdependent, changes to the entire industry structure may be identified.

A review of Australian and overseas literature for this research will identify the contemporary professional and academic structures of the geomatics' industry, efforts to initiate changes to technology and social requirements for spatial information. In addition, literature about related educational issues and phenomenography will also be reviewed.

A pilot study will be constructed from the finding of the literature review. The outcomes of this study will be used for the design and development of the research survey instrument. The analysis of the full survey data is expected to reveal people's perceptions of the 21st century beginning professional.

The synthesised literature review and research outcomes will clarify the Australian industry relevant geomatics' curricular principles for beginning geomatics' professionals in the 21st century.