

CONSTRUCTION MANAGEMENT EDUCATION FOR THE 21ST CENTURY: A SOUTH AFRICAN PERSPECTIVE

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The background to construction management education in South Africa up to the recent past is briefly reviewed. Anticipated future demands on construction management are identified in the context of changes in social, political, technological, legal, economic and other environmental factors.

New education policies are outlined, as are their impact on construction management education. The current state and dynamics of the South African construction industry are also reviewed. It is demonstrated that, although the industry is capable of remarkable achievements, much remains unchanged. In particular, attitudes, working conditions and procedures, conforming to time, budgetary and quality standards, the occurrence of defects, and the division between the design and delivery functions of the industry continue much as in the past.

The challenges presented to the South African construction industry and to construction management educators and researchers by environmental and education policy changes are daunting. An evaluation of these challenges as well as the results of a preliminary survey among academics and senior industry executives, have enabled the Department of Construction Management at the University of Port Elizabeth to transform its programmes in response to changing circumstances.

Keywords: construction management, education, future.

INTRODUCTION

Present day South Africa finds itself in a process of total transformation, following the political changes which developed over several years and culminated in the first fully democratic elections which took place during 1994. Scarcely an aspect of life remains untouched by this transformation. Changes are occurring in respect of cultural concepts, values, environmental issues, historical perceptions, developmental priorities, the economy and economic priorities, education, standards of living and national priorities, to mention only a few. Some of the changes are commendable and are aimed not only at redressing historical imbalances and anomalies but also at creating legislative, economic, regulatory, educational and value systems that will correspond to those in the developed countries.

One aspect which has been the subject of extensive review and will continue to experience the effects thereof for some time is the education system. Education is addressed not only in the Bill of Rights section of the Constitution of the Republic of South Africa (1996) but also through various other legislative and regulatory mechanisms. The stated objectives of the educational transformation process are, inter alia, to promote equity by making education at all levels available to all, to

redistribute educational resources, to redress the results of past inequalities and to promote educational and economic empowerment.

EDUCATION IN SOUTH AFRICA

The education system of the country has been and remains a multi-tiered system. A non-compulsory pre-primary system exists for children from the age of approximately 4 to 6 years. Formal primary schooling commences at the age of 6 years (Grade 1) and continues for 7 years to Grade 7. Thereafter, secondary schooling commences (Grade 8) and terminates at Grade 12. Public examinations are taken at this level.

The system caters for Government and private schools, commercial and technical schools at secondary level and schools to cater for special needs. Government schools are largely state-funded, but parents are required to pay school fees and cover certain other costs. Private schools are expensive but under certain circumstances can obtain State subsidies.

Tertiary education commences after Grade 12. A prescribed minimum Grade 12 performance (known as Matriculation Exemption) is required for University admission. Universities have some latitude, however, regarding admission, and most have their own potential tests or other criteria in excess of the minimum requirement. Three-year Bachelor's degrees are offered in the humanities and basic sciences, followed by Honours, Master's and Doctoral degrees. Bachelor's degrees in the professions are also offered (engineering, medicine, etc.). These are generally of 4 years or longer duration and candidates may proceed directly with Master's and thereafter Doctoral degrees.

In addition to Universities, a variety of career-orientated tertiary-level Diploma programmes are offered at Technikons (similar to Polytechnics). Recently, BTech, MTech and DTech programmes were also introduced.

CONSTRUCTION MANAGEMENT EDUCATION IN SOUTH AFRICA

During the late fifties the need for developing and commencing with tertiary level education programmes to produce construction managers was identified and initiated by the Building Industries Federation of South Africa (BIFSA).

Degree programmes in Construction Management (or other designations previously used) commenced in 1963 and about 1600 graduates have been produced by the six participating Universities to date. Construction industry education and training currently functions as follows (Eksteen 1996):

Operative and production supervisory training programmes are provided via industry organizations and Training Boards. Various shorter development programmes are also available, generally at supervisory, junior management, basic business skills and entrepreneurial levels.

Technikons provide various technical and technology programmes of 3 years and longer duration, and Universities provide four and five-year programmes aimed at producing graduates at a professional level who have a fundamental knowledge of the disciplines which comprise the construction process.

The system has several short-comings. Overall, the system is inadequately integrated and does not provide for the requirements of flexibility, progression, transferability of

credits and others, as required by new education policies. At tertiary level, the system does not provide for articulation between institutions. At undergraduate level, the Technikon structure provides several exit levels with the T3 and T4 diplomas and the BTech programmes. Universities have an all-or-nothing process, however. No matter what level prior to finalization a student may reach, no recognition is granted other than the award of the BSc degree when all requirements have been completed. Although some latitude has recently become possible, persons who lack adequate Grade 12 performance still find it difficult to gain admission.

The system has functioned acceptably up to now and has assisted in placing a number of persons with enhanced knowledge and skills in the industry. The qualifications do not make any provision for size and type of enterprise, type of work or level of operation, however. It can thus be argued that

- persons may be seen to be over-qualified for employment in certain circumstances, or that
- smaller, less sophisticated enterprises may feel that they cannot afford persons with such qualifications

The present system is also not geared to provide basic technological/supervisory/junior management personnel in a relatively short time for the country's short to medium term needs, nor to assist emerging contractors in respect of developing technological, business and management skills as part of an overall education system.

CURRENT POLICIES AND LEGISLATION AFFECTING CONSTRUCTION MANAGEMENT EDUCATION

Since 1994 numerous Government policies and legislation have been formulated and implemented, or are in the formulation process, which affect higher education, commerce, industry and society in various ways. Some of these which have relevance to the construction industry and construction education are:

Transformation of Higher Education

The NCHE report (1996) comprehensively examines Higher Education and, inter alia,:

- addresses the deficiencies of the system resulting from colonialism and the apartheid policies of the previous Government,
- considers the effects of higher education on a variety of issues such as the economy, political reforms, financial constraints and demographic factors,
- formulates a vision and principles (i.e. equity, democratization, development, quality, academic freedom, institutional autonomy, effectiveness and efficiency),
- identifies a number of goals such as: to provide a full spectrum of diverse programmes to as wide a range of the population as possible; to facilitate horizontal and vertical mobility; to advance higher education's function as a custodian of research; to promote capacity building; to promote inter- and intra-institutional interaction,
- refers to the South African Qualifications Authority (SAQA) and the National Qualifications Framework (NQF) as regulatory mechanisms for the total educational system, and

- proposes a transformation strategy for higher education which is having and will continue to have far-reaching effects on the functioning of tertiary institutions.

The S.A. Qualifications Authority (1995) has been established by Act of Parliament and incorporates the National Qualifications Framework and various Regulations concerning National Standards Bodies, Quality Assurance, Accreditation of Providers of Education and Training, Moderating and Professional Bodies and appurtenant procedural provisions.

The NQF establishes a framework of qualifications consisting of 8 levels, level 1 incorporating general education and training (primary school and adult basic education and training), through all stages to level 8, which covers Doctoral study. Levels 5 to 8 incorporate the spectrum of programmes which tertiary institutions would be expected to offer.

The legislation and regulations require all education and training providers, universities included, to register with SAQA. All programmes must be accredited. Should programmes not be registered or accredited, funding can be withheld. Programmes are to be “outcomes based”. i.e. clearly defined skills and abilities should be the end result of any programme of education. In order to promote mobility and articulation between institutions, programmes are to be offered and competence assessed on a modular basis, i.e. the traditional year-based academic process is to be replaced by a process based on shorter modules. Programmes are to have various entry levels, with clearly defined prerequisites and various exit levels, each with a suitable qualification attached thereto.

A considerable amount of academic re-engineering, detail work, changing of established mindsets and logistical re-organization has become necessary as result of these education policy developments.

Other Relevant Legislation and Policies

Construction and development processes, by their nature, impact on the environment in several ways. The National Environmental Management Act (1998) thus also places certain responsibilities on construction participants.

The principles of equity, non-discrimination and affirmative action have been affecting organizations in respect of transformation of their staff complements. The objective is that staff should be a reflection of the demographic composition of the country. The Employment Equity Act (1998) aims to achieve equity in the workplace and requires employers with larger than prescribed staff numbers or turnover to comply with prescriptions in this regard within a certain time frame. The Act defines “designated groups” as “black people, women and people with disabilities”. Onerous penalties can be imposed on persons who fail to comply with the Act.

This legislation makes it incumbent upon construction employers to recruit, develop, educate and employ persons from designated groups and hence also to transform and reorganize their business environment, practices and procedures accordingly.

About to be promulgated is legislation establishing a comprehensive construction industry policy for the country. The policy (Dept. of Public Works: 1997) covers every conceivable aspect of the construction industry and will produce many positive effects. However, the firms and organizations comprising the industry will have to adapt attitudes, business practices and procedures considerably.

State procurement policies have been reformulated whereby design consultants and contractors now have to comply with certain prescribed affirmative action criteria in order to be considered for appointment on State projects (Dept. of Public Works: 1998; Rep. of S.A.: 1998). These policies are aimed not only at equity and equal opportunities but also at promoting and creating opportunities for developing historically disadvantaged firms and individuals. A feature of these policies is that, in employing or collaborating with historically disadvantaged individuals or firms, established firms are required to provide adequate training resources.

PROFILE OF THE SOUTH AFRICAN CONSTRUCTION INDUSTRY

The South African construction industry displays a structure similar to that of many other countries. A relatively small number of large, public companies operate nationally and some of these operate internationally, particularly in Sub-Saharan Africa, in recent times. The rest of the firms range from small enterprises to relatively large regionally based firms. A substantial number of specialist contractors exist and the country is well supplied with manufacturers of construction materials, from cement and ceramic materials to timber, steel and aluminium products. Construction material merchants are also present in all regions.

Design and construct firms also exist, particularly in housing development. Other types of participants are the usual range of design professionals, project managers, property developers, etc. Over the fairly recent past, labour-only sub-contracting has become commonplace and many of these enterprises have come from the ranks of historically disadvantaged individuals. Since the political changes, so-called emergent contractors have also become an important factor. These firms often lack construction business skills, yet compete with established contractors, especially on public sector projects, in accordance with official policies previously mentioned.

Especially the large, sophisticated firms are capable of successfully dealing with a variety of complex projects, including fast track processes. In cases where size or complexity require it, they enter into joint ventures with overseas firms.

Despite its achievements, however, the industry displays deficiencies and inefficiencies in many respects, for example:

- attitudes within and about the industry,
- unfavourable working conditions and procedures,
- insufficient attention to health and safety,
- questionable ability to deliver within time and budgeting constraints and to required quality standards,
- communication and other difficulties arising from the division between the design and delivery functions and
- the occurrence of defects and disasters.

INDUSTRY ISSUES DEMANDING INCREASED AND IMPROVED CONSTRUCTION MANAGEMENT EDUCATIONAL EFFORT

Although the industry has for some time been in a recession due to economic factors, lack of developmental policy formation and lack of prioritization, the Government is committed to large-scale development of the country.

Since little can occur in to-day's world unless it has been preceded by construction, the industry has a major developmental role to fulfil. The industry is also a major employer and is expected to fulfil a major job creation role. (Eksteen 1996).

It has been variously estimated that the management: operative ratio of the economically active portion of the South African population is in the region of 1:50. This compares unfavourably with similar estimates for developed countries (in the region of 1:10). A comparative ratio for the South African construction industry is not known but may well be less favourable than the overall 1:50 ratio.

Advancing technology and complex projects and documentation increase risk exposure and liability for product and service. Following the disastrous collapse of a slimes dam in the Free State Gold Fields a few years ago, which caused extensive destruction, injury and death to persons and property in the adjacent town, for example, the Court found that the contractor's personnel were inadequately qualified to carry out work of this nature.

Other disasters which have occurred in recent years and can, at least in part, be ascribed to inadequate education and training are:

- Serious defects to a power station smokestack, requiring it to be demolished by implosion. The smokestack collapsed onto the power station buildings, causing further damage. Protracted litigation ensued.
- Collapses of excavations, resulting in injury and death.
- The collapse of a building under construction in Pretoria about 2 years ago, resulting in damage and death.
- The collapse of a bridge under construction in Mpumalanga province in 1998, resulting in 14 deaths and several injuries. (Dorfling 1999).

The industry is expected to meet the demands of increased output and productivity, higher quality standards and lower prices. Consumer awareness requires higher levels of service and of providing value for money, and failure to do so may result in increasing litigation.

Labour-related factors occur, such as sophisticated legislation and union demands for improved working conditions and amenities, worker participation and the like.

Educational anomalies exist. For example, entry to the design professions requires strictly monitored academic qualifications and statutory registration, whereas those responsible for the physical reality of construction with all the appurtenant risks have no similar educational prerequisites. Large numbers of operatives also have little or no training behind them. Then emerging contractors and labour-only sub-contractors in particular lack adequate technical, managerial and entrepreneurial training.

Increasing competition is occurring as a result of the changes taking place in the country. It is doubtful whether the construction industry is ready to meet this competition.

Design education requires attention too, since little attention is paid to aspects such as constructability, material compatibility, risk, safety and other related aspects. The Construction professions and educational institutions need to complement one another in an integrated system. Clearly, no education or irrelevant education or practical exposure and/or a technical base only are no longer adequate. An overhaul of the current education system is thus required to provide the industry's future managers, leaders, designers, technologists and operatives.

Construction education survey

Part of this research included a preliminary survey among 7 construction management academics and 12 construction executives in senior positions in construction firms or industry organizations. Three questionnaires were returned by academics and 4 by executives.

The general objective of the survey was to obtain impressions from academic and industry leaders on current industry problem areas, solutions thereto, the efficacy of education programmes and the contribution of research. The impressions gained would assist the process of transforming the education programmes, especially in respect of relevance and content.

Questions 1, 2, 3 and 7 of the questionnaire were purposely stated as open response questions to encourage freedom of expression. The remaining 3 questions asked respondents to rate the relevant issues on a 5-point scale. The response to questions 1, 2, 3 and 7 were varied and were analysed by means of grouping them together under related themes. Responses to the remaining 3 questions were rated on a 5-point scale and the analysis entailed the aggregation of the ratings. The questions comprising the questionnaire are reproduced as follows and summaries of the responses are included:

- Question 1: What are the 5 major problem areas which in your opinion currently exist in the management of construction processes in South Africa? The majority of responses identified deficiencies in management skills and ability, and factors such as productivity, quality, lack of business skills, lack of suitably trained staff and related aspects at all levels of the industry, including sub-contractors and the design professions. Lack of investment in education, training, research and development were also mentioned.
- Question 2: What in your opinion are short-term solutions to the problems you identified above? The persistent theme reflected in the responses was that of education and training at all levels, including project management and the design team.
- Question 3: What in your opinion are long-term solutions to the problems you identified above? Education and training at tertiary and other levels, including management education for the industry, clients and the design professions, increased investment in education, long-term planning and budgeting are the main themes that emerged here.
- Question 4: Referring to the 5 problem areas you identified in 1. above, to what extent do you think that research can assist in arriving at solutions? The majority

of responses from academics indicated that research could assist extensively in arriving at solutions. Responses from executives indicated no clear trend.

- Question 5: Again referring to the 5 problems in 1. above, to what extent do you think that current South African construction management education and training programmes can assist in arriving at solutions? The overall response overwhelmingly indicated that education programmes could extensively assist in arriving at solutions.
- Question 6: Again referring to the 5 problems in 1. above, to what extent do you think that current South African construction management education and training programmes include material relevant to overcoming the problems? The overall response indicated a neutral to negative trend, the conclusion thus being that education programmes require reviewing and adjustment.
- Question 7: Please list 5 construction management related topics in which, to your knowledge, research is currently being conducted internationally. Executives all responded that they were unable to answer this question. Academics listed a variety of topics, including procurement, construction industry development in emerging countries, housing provision, health and safety, quality management, risk management, productivity, process re-engineering and others.

RESPONSES OF THE UNIVERSITY OF PORT ELIZABETH

The review and assessment of the environmental, social, industry, education policy and other factors, as described, has resulted in:

- The restructuring of the programme into a multiple-phased, multiple entry and exit point programme.
- The modularization of course content, thus promoting mobility.
- A review and consolidation of course content, the introduction of new topics and the expansion of certain existing topics to meet anticipated future industry demands.

The traditional programme of 5 years' duration, including a prescribed practical work component in industry, is thus being phased out. It is being replaced by the following, the phasing-in of which commenced two years ago:

- A pre-entry development programme leading to the Certificate in Basic Construction. This enables candidates who do not meet the admission requirements for the degree programme to rectify their deficiencies while gaining some credits towards the degree programme. After attaining the Certificate, employment may be taken up in small or emerging enterprises.
- Following and partially overlapping the Certificate programme, is a 3-year degree programme leading to the Bachelor of Building Arts in Construction Management. Graduates may pursue post-graduate studies in various disciplines or take up employment in lower management or technical positions in small to medium enterprises.
- Next follows a year-long practical work programme which is a prerequisite for the next phase of the programme.

- The final phase is a programme leading to the post-graduate (Honours level) BSc (ConstrMan) degree. Admission requirements will be the 3-year degree described above, or another relevant Bachelor's degree, plus the equivalent of the practical work mentioned above. Graduates may seek employment in middle and senior management positions in a variety of construction-related occupations. This qualification will be the one eligible for professional membership and registration.
- A variant of the previously described programme is the Post-graduate Diploma in Construction Management. The difference is that the Diploma programme requires fewer credits than the BSc (ConstrMan) programme and caters for persons whose commitments prevent them from enrolling for the degree programme.

CONCLUSION

Social, political, environmental, economic, policy and legal factors in present-day South Africa demand that a fresh approach to construction education and industrial processes and attitudes be taken.

These factors have been briefly reviewed by means of exploring relevant official literature, recording observations about the nature and performance of the construction industry and conducting a preliminary survey on aspects of construction education, problems and research.

The influence of environmental and societal forces, the importance of ongoing research and the relevance of these factors in respect of the nature, content and structuring of education programmes are also clearly illustrated.

The survey indicated awareness among academics about international research topics, some of which are relevant to current South African construction challenges. It also indicated that construction executives seem to be unaware of current research initiatives and this may be interpreted as a demonstration of a gap between academic work and industry implementation thereof. This is a possible area for further research.

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