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The Role Of Education As An Agent Of Change: A Two Fold Effect

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Abstract

Several aspects of change to the procedures in the construction delivery process have been described in recent times, particularly those affecting building procurement systems. This paper describes the results of an investigation into one of the underlying causes of such change, particularly that which is affecting the traditional roles of the various parties that participate in the construction procurement process. It is proposed that one of the 'agents' of change is the product of tertiary education programmes that have been producing 'professional builders'. It describes how a new generation of builders, equipped with business skills and an inherent dissatisfaction with the traditional structure and procedures of the industry, are allowing leading construction companies to develop innovative construction marketing strategies and systems. These systems are based upon sound business practice, offer improved customer satisfaction and allow them to get closer to customers. In so doing they are taking over the roles of various built environment consultants who were principal agents and leaders in the traditional building procurement system.

In parallel with the development of the professional builder, a decline in the numbers and calibre of craftsmen entering the industry has occurred. It is suggested that a 'cause/effect' relationship may exist between these two phenomena.

Keywords: Procurement, change, education, career paths, competitive advantage.

Introduction

This paper was conceived when the authors noted similarities between changes in the procedures and practices of the British and the South African construction industries. Whilst most of the data is drawn from these countries, the phenomena described would seem to be common to most construction industries where the British model was adopted in the development of structure and procedures.

Forces of change have impacted upon the construction industry in recent years and despite resistance, change is occurring which is affecting established practices and procedures. Amongst the various changes noted by authors such as Moore (1984), Ball (1988), Hillebrandt and Cannon (1990), Franks (1990) and Clarke (1992) are changes to its structure, practices and procedures.

Change of this nature can be expected to have an effect on the roles played by the numerous entities in the fragmented building process. Such observations have been made by Ramsay (1989), with regard to contractors, by Gray and Flanagan (1989), with regard to specialist contractors and by Duffy (1992) and Francis (1988) with regard to designers.

The traditional hierarchial structure found in the British model of the construction industry is threatened as the procedures and relationships of the various types of customers, consultants and contractors break down traditional barriers. This change, deemed as essential by many observers, such as Emmerson (1962), Bowley (1966) and Ball (1988), is resisted by most role players in construction, particularly the built environment professions.

Lewis and Cheetham (1993) whilst commenting on change, particularly to the separation between design and construction and new building procurement methods, stated:

"the new methods have failed to alter the social hierarchy in the industry and relationships between its principle groups, which are hangovers from former times, remain to form barriers to a truly efficient industry"

Bowley (1966) described an industry which was `crying out' for change and whilst describing several aspects of the industry's response and resistance to it, she implied that the education of builders could become the catalyst of change. However, whilst change has occurred since then and has been described, very little has been written about the source or reasons for it. Those who have offered explanation have concentrated on the change in building procurement systems, citing the demands of private sector customers, (Moore 1984, Hillebrandt and Cannon 1990). Amongst other explanations that have been put forward are, the effects of steep economic recessions, (Hillebrandt *et al* 1995) and the `global village' effect of the information technology age.

This paper offers the hypothesis; `one of the major contributory `agents' of change to procedures in the construction industry is education, specifically, the education of builders. However, this can be seen to have had a two-fold effect, one of which is positive the other, negative'.

Change and the Barriers between Participants in the Construction Process

Many writers have described problems in the construction delivery process. One of the more serious ones being, the separation of design from assembly. This, when the Architects Registration Act of 1931 was promulgated, effectively, created a hierarchial structure with architects positioned above other consultants and contractors who found themselves at the lowest level. Bowley (1966) stated that architects saw themselves as socially superior and, in terms of work organisation, this resulted in the segregation of specialists. This created barriers to communication, common education, training and knowledge formation.

"It is difficult to see how any system more wasteful of technical knowledge, intellectual ability and practical and organisational experience could have been invented". Bowley (1966: 352)

Bowley's observations would seem to fit those described by Larson (1977) and others who have studied the sociology of the professions. Such social and economic effects occur with the rise of professionalism in a society.

Change is occurring which has resulted in simplification of the construction process, lowering of communications barriers and the adoption of sound business practices. This is precisely that which has been advocated by concerned persons for many years and it is being brought about by the advent of `construction marketing systems' (CMS) and `building delivery systems' (BDS), (See for instance, Hillebrandt and Cannon 1990, Bruce 1996, Keane 1996). Amongst these new systems are those known commonly as: `project management', `design and build', `construction management' and `management contracting'. These systems are often led by construction firms. (See for instance, Ashworth 1991 and Carty 1995)

Historical Roots of Education in Construction

There are numerous accounts of the evolution of the present structure and procedures of the industry, such as those provided by Bowley (1966), Bowyer (1973), Kostof (1977), Saint (1983), Ball (1988), Oglesby (1990) and Crinson and Lubbock (1994), all of them describe the evolution of a system designed to suit the `professions' rather than the broader industry or the client, in what Ball (1988) succinctly described as "a remarkable political coup".

The Architects Registration Act of 1931, set into motion the separate identification of skills involved in the building delivery system. A separation which stifled communication and development of the industry. Each of the disciplines so created, formed distinctly separate identities and systems which suited their perceived skills base. Each promoted their `profession' by establishing the discipline at universities. A step which enforced the divisions which persist to this day in the British model of the construction industry. Architects were the first to establish specialised training schools and courses. Bowyer (1973) described the establishment of a system of pupillage training in the mid seventeenth century. In 1847 the first isolated attempts at more formal education and training commenced and it was formalised in 1887. Soon after the engineers commenced separate education programmes, followed by quantity surveyors whose institute commenced with entrance examinations in 1881 . Builders were left with the traditional training system, passed down by the Guilds who created and governed the system of learning by working with a craftsman, a system which had served to train all, before the separation of architects.

In 1834 a number of eminent London builders formed the Builders Society which developed to become the Institute of Building in 1868. In 1881 a system of examinations to test the knowledge and ability of potential members, was introduced and in this way the Institute led the way and promoted the education of builders. Their efforts led to the formation of departments and programmes at universities and technical colleges where students were offered courses which would provide them with recognised qualifications and prepare them for corporate membership of the Institute. They introduced management into their syllabus and in so doing became the only professional institution with an emphasis on the management of construction (Hillebrandt 1984).

It was only with the formation of the Institute of Building and the introduction of entrance examinations in 1924 that builders began to broaden their education. In the 1950's the first technical college and university courses for builders were developed and it was only from the mid 1960's that such courses became established at a number of education institutions. Tables 1 and 2 give some indication of the growth and success of these courses since their establishment. Bale (1984) reasoned that growth would not take place unless graduates and diplomates were recognised by the industry. The figures in these tables do indicate growth but is this the only measure of success ? In the next section other measures are used.

YEAR	HND	DEGREE	TOTAL
1963	120	28	148
1973	322	227	549
1983	547	310	857

Table 1 UK Annual Output of Degree & HND-holders in Building

YEAR	DEGREES	YEAR	DEGREES
1966	2	1986	68
1976	48	1994	104

Table 2 South African Annual Output of Degrees in Building (Source: Building Industries Federation of South Africa)

Because of the nature of construction, managers of construction projects and production divisions of construction enterprises, are usually recruited from within the industry. This is confirmed by Young (1989) in Figure 1, where the typical durations spent by aspirant managers in other positions are shown. Such positions are career positions and very few examples of `cross-over' from other industries or professions are found. (Hillebrandt and Cannon 1990)

Before the advent of tertiary education programmes for construction disciplines the Guilds, then the Trades, became the essential training sources and routes through which managers of construction projects and companies evolved. With the formation of the `professions' the opportunity for more appropriate tertiary education programmes for construction became a reality but through elitism and `fragmentation' the opportunity was confined to a select group. Bowley (1966) described how the formation of the building professions and their pursuit of status caused barriers, social and professional, to the industry which deprived the industry of many intelligent entrants. In addition, architects who had the benefit of tertiary education were prevented from becoming contractors, leaving `the trades' as the sole method of training managers of construction firms.

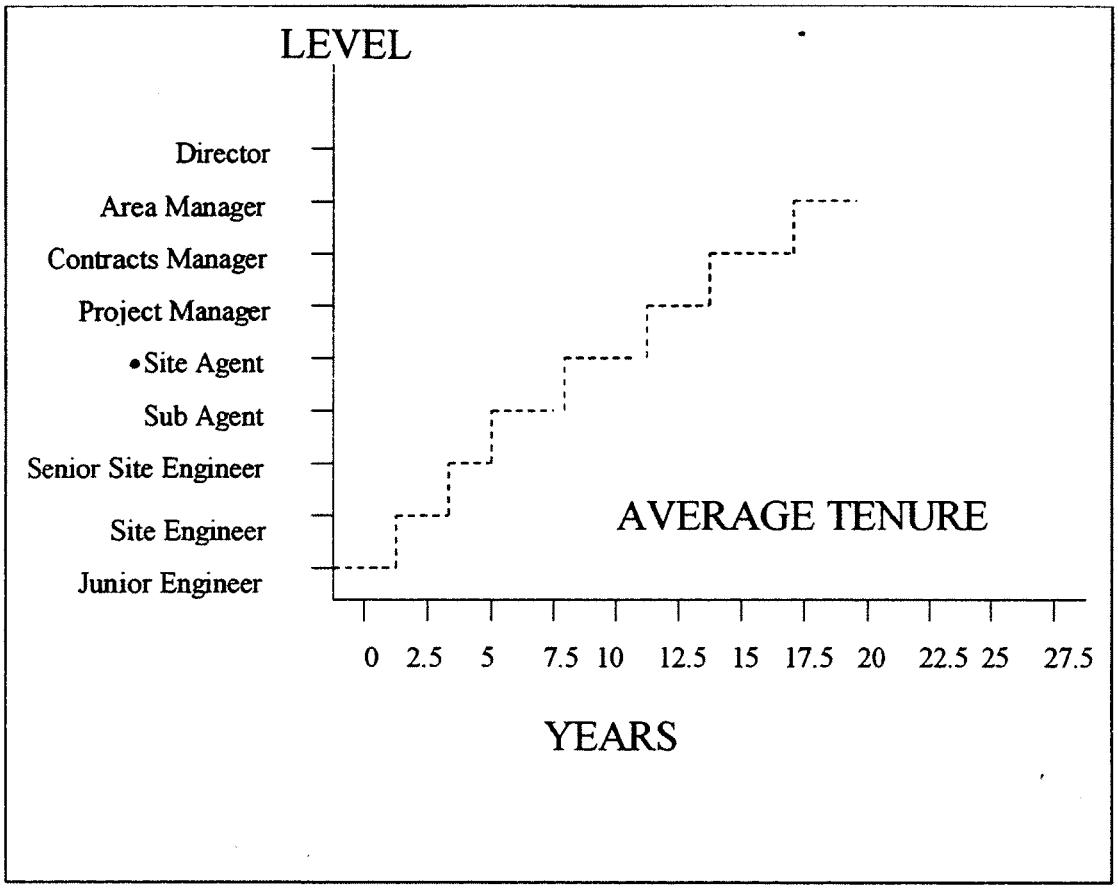


Figure 1:Career Path of Building Construction Managers Showing Average Tenure (Source: Young 1989)

Patchett (1980) noted that during the late 1970's, employers were still overwhelmingly inclined to employ managers from the practically-based ranks as opposed to those from tertiary institutions. Clarke (1992) conducted a survey of UK construction sites, as part of an international study of site organisation and found that the change in nature of site management was expressed most clearly in the changing qualifications of site managers. Whilst some firms continued to rely on recruiting trade based site managers most reported a growing tendency to recruit graduates.

Young and Duff (1990) described three alternative career paths for construction managers, shown in Figure 2. Three alternative routes, stemming from, civil engineering, building engineering and the building trades.

Within this management tree, three distinct levels of construction managers are discernible. Level one being the senior managers (i.e. Directors and Area Managers), level two being the mid-level managers (i.e. Contracts and Project Managers) and level three the junior managers (i.e. Site and Sub-agents). These levels are in turn defined in terms of managers being office-bound (senior), liaising between the office and different sites (mid-level) and being site bound (junior).

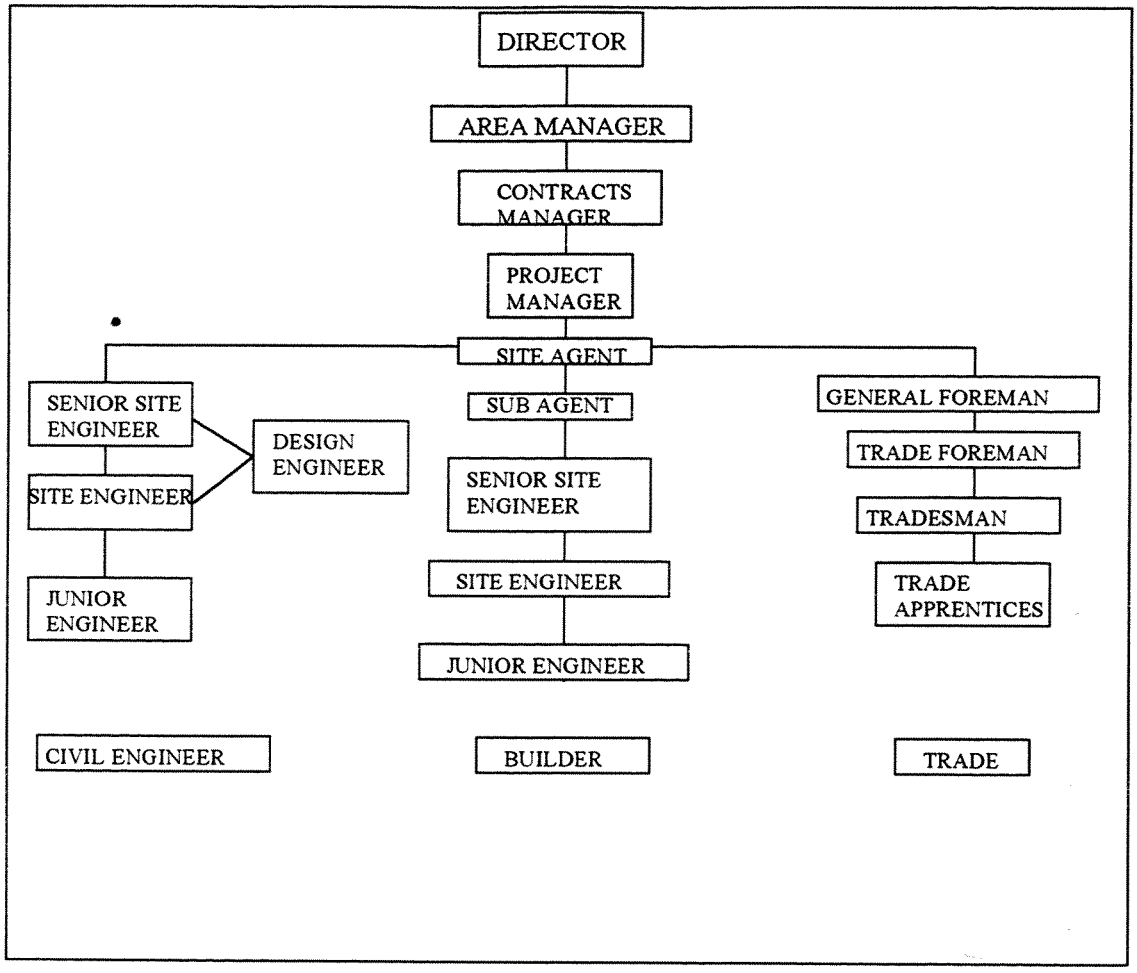


Figure 2. Career Map Showing Routes of Progression to Construction Management (Source: Young and Duff 1990)

Young (1989) stated that of the three routes of progression identified, those who progressed quickly, i.e. those having the shorter tenure periods and who were more likely to reach senior management positions, were individuals with `building engineering' training and backgrounds. Least successful in this hierarchical assent were the trade-based managers.

It can be seen that the trade route of old has given way to those educated and trained in technology and management at tertiary institutions.

The Age of the Professional Builder

That change in the industry would originate in the camp of construction management was alluded to by Bowley (1966). She noted that the principals of the larger firms, at that time, had become more critical of the inefficiencies of the system, less willing to accept an inferior role in the traditional hierarchy and eager to take a hand in determining the nature of the products that they made. She went on to question the fitness of the entrepreneurial and managerial personnel in the industry, for the purpose of effecting the necessary changes.

This, of course, was at a time when the first university courses for builders were being introduced.

More recently Ramsay (1989), whilst discussing the need for a bold strategy to create change to the existing process and structure of the industry, asked the question; "Who should be the agent for change in this strategy? It is not likely to be the client, who is often unsophisticated and plays no role in actually creating an end product. It is not likely to be the architect or the engineer, since change militates against his own economic interest and his present position of privilege. The agent for change must be the contractor, for he is the only party who is able to take the process apart and put it together again"

Much of the change that is occurring is indeed emanating from the contractor's office, in the person of the new generation of managers who have been educated in business management and marketing, designed specifically for managers in the construction process.

Intolerance of the System

The proving ground of managers in construction is the `site' where project management skills were developed to achieve objectives in conditions where uncertainty is the norm. Successful project managers are competent to handle any scale or type of project, anywhere in the world. Skills which could be described as being of a higher order than those required for general production management. These managers, most of whom would be found to be members of the Chartered Institute of Building and like bodies, are professionals who have a poor perception of the leadership qualities offered in the traditional building procurement system (Faulkner and Day 1986).

Bowley (1966) observed this phenomenon (quoted above) and it has been noted subsequently by other authors, such as Ball (1988) who, whilst questioning the existence of `a new social balance in the construction industry', stated, "no-one - apart from architects - unquestioningly accepts the role architects have assigned themselves". Implicit in this statement is the rejection by contractors of the hierarchial structure and position of leadership that architects have created for themselves in the traditional building delivery process.

That this intolerance is increasing can also be found in the growing number of books and papers concerning the need to `restructure' the industry. In the UK for example, Lewis and Cheetham (1993) and the National Economic Development Council (NEDC 1990) which produced a report, emanating from `the construction industry sector group', entitled Construction: Restructure to win. In 1991 a working commission of CIB, W82 `Future Studies in Construction', started an international study project to develop scenarios for the future organisation of the building process and some of the findings have recently been published (Lahdenperä 1995, Bakens 1996). Again in the UK the government and industry undertook a review of procurement practice and contractual arrangements which culminated in a report entitled "Constructing the Team". This report, commonly referred to as `the Latham Report' (Latham 1994), is the most recent in a series of such investigations, all of which suggested that change was needed.

Hillebrandt *et al* (1995) noted a change in the industry, brought about by the industry itself. They described a new form of independence, stating, "This change in contractors' attitudes, has been fostered by a younger generation of top executives"...

It is not only managers in construction who are seeking change. Ashworth (1991) described how all of the players in the industry are aware of a need to change Architects demonstrated

this in the preparation of the RIBA (1992) strategic plan. However, quantity surveyors who may be motivated more by a sense of survival, seem to be intent upon finding new potential rolls for themselves, as they observe the demise of the `traditional structure'. One of the important aspects of change that this move has created is the trend towards combined education, where students of quantity surveying are joining students of construction management in common courses. In this way they are looking to management and marketing as a strategy for survival (Lay *et al* 1991).

The Net Effect of Education for Builders

Whilst architects, engineers and quantity surveyors, formed separate identities, builders were excluded from the process of educational development. After the formation of the Institute of Building, they also pursued separate development supported by tertiary education and continuing educational programmes. This, to prepare their members to interface with consultants and clients on equal terms. The process which gained momentum in the 1950's and 60's has only recently come to fruition as a growing body of skilled people have developed and gained positions of power and influence. Positions from which they are best able to apply their education and business skills to gain strategic advantage. It would seem, though, that the original intention has been surpassed as professional managers in construction find themselves able to compete, not as equals but as leaders in the construction delivery process.

Other writers who have noted the contractors roll in change include:

1. Trench (1980), commented on the role of builders education on moves towards design and build offered by commercial firms.

2. Groak (1983), whilst describing a number of `instigators' of change described the intervention of contractors. He noted that contractors, whilst attempting to reduce the uncertainty which they face, were offering package deals and entering into contracts directly with clients.

3. Groak and Ive (1986) observed, ... "we find the emergence of the large firms into more varied work, and the utilization of modern management methods".

4. Ball (1988) who described a social change that had taken place whereby contractors had pushed outwards their boundary of control at the expense of designers. Firms were displaying greater ability and marketing skills by taking longer-term strategic attitudes towards particular market sectors.

5. Hillebrandt and Cannon (1990) noted that change is occurring and that one notable aspect is that the contractor is moving closer to the client.

6. Gann (1991) commenting on a number of procurement forms that have been introduced, stated, "These have been adopted by innovative firms at the `leading edge' of change in the industry".

7. Hillebrandt *et al* (1995) described change that had occurred in the way that large construction firms participated in markets, between 1986 and 1995. They described four distinct ways of differentiating the construction product or service :

- by offering a range of methods to manage projects
- by backward integration into design
- by backward integration - offering financial packages
- by forward integration - facilities management

It would seem then, that contractors are becoming pro-active in terms of marketing and getting closer to construction customers. In this respect, it can be said that they have adopted proven business practices and are now able to offer more than the basic contracting service. They are able to conceive development projects, find finance and offer a total package to investors, including management of design and maintenance of the finished product. In can be seen that they have moved from the reactive role of contractors, (being selected to fit into a building procurement system), to a proactive role where they develop strategies to sell their products and services to construction customers. They develop construction marketing systems.

Because the industry as a whole (particularly in South Africa, see Ofori *et al* 1996 and Hindle 1996) lacks leadership and direction, it is left to individual business entities to search for new direction. Many of the more successful ones are changing the way in which they market their services and products (Hillebrandt *et al* 1995). It began with random attempts to find new ways of marketing construction services, some failed, some succeeded and others emulated the successful ones. Marketing methods were adapted from other countries or even other industries. Most have been well documented and given names, such as, `Design and Build', `Turnkey', `Management Contracting', `Construction Management' and `BOOT', all of which entail early involvement of contractors in the building delivery process, (McDermott and Jaggar 1996). However, not all of the new methods have been documented and others are being pioneered by innovative contracting companies, most of whom are creating competitive advantage or niche markets and do not `broadcast' their success. They are creating the paths which are likely to determine the future direction of the construction industry.

The Demise of the Craftsman

That the number of new entrants into the trades is declining, in the UK and South Africa, has been well reported. Table 3 shows the decline in the registration of apprentices in South Africa whilst the problem in the UK is described by Gauldie (1980), by Guest and Steadman (1987) and by Holmes and Wornell (1995).

	1979	1981	1983	1985	1987	1989	1991	1993	1995
Total all trades	1463	2199	2867	1040	286	256	448	215	295

Table 3 Total Building Trades Apprentice Registrations in South Africa (Source: Building Industries Training Board)

In 1966 this dilemma of falling apprentice numbers was foreseen by Bowley. She expressed concern because of a change in the British education system which she believed .."would syphon off the abler boys into technical and grammar schools and to universities. The supply

of potential intelligent craftsmen required for traditional building may well be gradually dried up by this process" (Bowley 1966).

The subsequent demise of the craftsman is generally believed to be a phenomenon caused by fluctuations in the demand for buildings and the industry-wide move towards subcontracting and the subsequent demise of direct employment by construction companies (Rainbird 1991). In an article by Guest and Steadman (1987) entitled; 'Death of the Craftsman' these sentiments were expressed together with a comment about the poor quality of apprentice candidates. They attempted to find the causes of the shortages of craftsmen and apprentices and described the results of two surveys which listed the following reasons:

1. Lack of training
2. Trend towards self employment
3. The poor state of the economy
4. The high cost of apprentices
5. Low pay and poor conditions in the industry

Gauldie (1980) laid much of the blame for declining quality on the hierarchial structure of the industry and the reactive roll which craftsmen have been asked to adopt. In this system they are often seen to be 'ignoramuses', an image which is not likely to encourage bright young people to join their ranks.

None of these authors considered the fact that, from the early 1960's, potential recruits could choose an alternative career path, leading to construction management, which offered status and improved conditions. Can it be coincidental that apprentice numbers have been declining since the mid 1960's ? (Rainbird 1991). This decline in the quality of the apprentice can be attributed to the success of the tertiary education programmes. Hillebrandt (1984) stated, "One problem is that the sifting that now takes place in the educational system may well mean that those with general ability, including management ability, do get selected by the education system and therefore that a craftsman is less likely now than thirty years ago to become a senior manager." Because of these new tertiary education programmes it is likely that those who could not achieve the entrance requirements were the ones to take-up the option of an apprenticeship.

Clarke (1992) suggested that one reason for the decline in apprentice training was, that the training given was not appropriate for the needs of the industry in the 1980's. Clarke also showed that apprentice training was declining whilst contractors workloads were not. This presents another aspect to the question of new entrant choice. Even if the candidate was inclined towards an apprenticeship there have been fewer and fewer positions on offer since the commencement of the present decline in apprentice numbers. That technician or management trainee positions were available can be deduced from the fact that such training programmes were introduced about the same time (mid 1960's) and construction firms, whilst reducing the number of direct employees, retained or increased the number of managers, surveyors and supervisors, to deal with subcontract labour (Clarke 1992).

It is clear that the apprenticeship training programmes have not kept pace with change whilst new programmes were designed to produce the kind of technician and management graduate that the industry required. Imbert (1990) supported this argument when he referred to an imbalance that has occurred in some countries where education and training programmes for the industry have been introduced: .."these have often been lop-sided, with professional skills being emphasized at the expense of craft training". For the British construction industry, this should be of great importance, given that their European

competitors, such as France and Germany, have a situation where the quality and skill level of the craftsman is increasing (Boberoff 1991, Streeck and Hilbert 1991). Education of builders has moved `from sitting with Nellie' to tertiary education, focusing specifically on science, technology, engineering and management (Cooke 1991).

Conclusions

The old trade based managers of the past have given way to the products of tertiary education programmes where management of construction is a focal-point. This new generation of managers in construction would seem to have adopted and applied sound management practices, particularly marketing, which have allowed them to implement new construction marketing systems whilst getting closer to their customers and offering new services.

However, a second effect of this education driven process would seem to be one that has contributed to the decline in the number and calibre of the craftsmen and apprentices entering the industry. Now that more attractive alternative career routes are available to good quality industry entrants it would seem natural that they should choose this in preference to the apprenticeship route.

If this trend should continue it is likely that the next generation of professional managers in construction are likely to have few craftsmen to manage. Indeed, it is possible that there will be more managers than craftsmen in time to come. This is a fear which was expressed by Trench (1980) when he spoke about the future of construction. He spoke of a time when the management of construction firms would have many recruits, because of improved education and image of the builder. He went on to say ... But what does one do with an army where Generals plan, the Staff Officers issue memoranda, but there are no battalions left to fight the war?

The evidence presented here would seem to indicate that education, particularly that of managers in the construction process, has been an agent of change. It is acknowledged that this is only one of several `agents' of change, that have been described by other writers. It would appear to be an agent of change that others have not considered. Future studies may well be able to verify these findings and to quantify the impact of the various agents of change

REFERENCES:

Ashworth, A. (1991) *Contract Procedures in the Construction Industry*, 2nd ed. Longman Scientific and Technical, London.

Bakens, W (ed.) (1996) *Future organisation of the building process*, Final report, Rotterdam, NL: International Council for Building Research Studies and Documentation CIB, abt. 200p. CIB Publication 174 (to be published)

Bale, J. (1984) Towards a strategy for higher education, *Building Technology & Management*, September, 51-53.

Ball, M (1988) *Rebuilding Construction: economic change and the British construction industry*. Routledge, London.

Bobroff, J. (1991) New Competencies within the French Construction Industry: their Determinants and the Strategies of Firms, in Rainbird, H. and Syben, G. (eds), *Restructuring a Traditional Industry: Construction employment and skills in Europe*, Berg, Oxford.

Bowley, M. (1966) *The British building industry: Four studies in response and resistance to change*, Cambridge University Press.

Bowyer, J. (1973) *History of building*, Crosby Lockwood Staples, London.

Bruce, B. (1996) Taking a big step away from "simply contracting", *SA Builder*, November, No. 879, 5, Building Industries Federation of South Africa.

Carty, G.J. (1995) Construction, *Journal of Construction Engineering and Management*, Vol.121, No.3, 319-328.

Clarke, L. (1992) *The Building Labour Process: Problems of Skills, Training and Employment in the British Construction Industry in the 1980's*, Occasional Paper No. 50, CIOB, Ascot.

Cooke, G.M. (1981) Foundations built on science, *Chartered Builder*, November, 14-15.

Crinson, M. and Lubbock, J. (1994) *Architecture: art of profession? Three hundred years of architectural education in Britain*. The Prince of Wales's Institute of Architecture, Manchester University Press, Manchester.

Duffy, F (1992) Survival of the species, *Building*, 17 July, 20-22.

Emmerson, Sir H (1962) *Survey of problems before the constructionindustries*, report commissioned by the Minister of Works, British Government, H.M.S.O.

Faulkner, A.C. and Day, A.K. (1986) Images of status and performance in building team occupations, *Construction Management and Economics*, 4, 245-260.

Francis, W (1988) Traditional divisions disappear in UK construction industry, *S.A. Construction World*, September. 26,27,29.

Franks, J (1990) *Building procurement systems*, 2nd edition. UK. CIOB, Ascot.

Gann, D. (1991) New Management Strategies and the Fast-track Phenomenon in Britain, in Rainbird, H. and Syben, G. (eds), *Restructuring a Traditional Industry: Construction employment and skills in Europe*, Berg, Oxford.

Gauldie, W.S. (1980) The pursuit of excellence, *Building Technology and Management*, February, 3-8.

Gray, C and Flanagan, R.(1989) *The Changing Role of Specialist and Trade Contractors*: UK, Chartered Institute of Building, Ascot.

Groak, S. (1983) Building Processes and Technological Choice, *Habitat International*, Vol.7, No.5/6, 357-366.

Groak, S. and Ive, G. (1986) Economics and Technological Change: Some implications for the study of the building industry, *Habitat International*, Vol.10, No.4, 115-136.

Guest, P. & Steadman, R. (1987) Death of the Craftsman, *Building*, 30 January, 26-29.

Hillebrandt, P.M. (1984) *Analysis of the British Construction Industry*, Macmillan, London.

Hillebrandt, P.M. and Cannon, C. (1989) *The Management of construction firms: Aspects of theory*, UK, Macmillan, London.

Hillebrandt, P.M. and Cannon, C. (1990) *The modern construction firm*, UK, Macmillan, London.

Hillebrandt, P.M. Cannon, C. and Lansley, L. (1995) (129) *The Construction Company in and out of Recession*, UK, Macmillan, London.

Hindle, R.D. (1995) Construction marketing Systems gain ground, *SAPOA News*, South African Property Owners Association, March 1995, 15-18.

Hindle, R.D. (1996) Do we need the professions?, *Project Pro*, March, South Africa.

Holmes, R. and Wornell, P. (1995) Premature failure of building components in social housing - managing the risk, *Construction Papers*, No.46, Chartered Institute of Building.

Imbert, I.D.C. (1990) Human issues affecting construction in developing countries, *Construction Management and Economics*, 8, 219-228.

Keane, J. (1996) A glossary of opportunity, *Construction Manager*, Dec' 95/Jan' 96, 11, Chartered Institute of Building, UK.

Kostoff, S. (ed) (1977) *The Architect: Chapters in the History of the Profession*, Oxford University Press.

Lahdenperä, P. (1995) *Reorganising the building process: The holistic approach*, Technical Research Centre of Finland, ESPOO, VTT Publications, 217p.

Larson, M.S. (1977) as described in Macdonald, K.M. (1995) *The Sociology of the Professions*, Sage Publications, London.

Latham, Sir M. (1994) *Constructing the Team*, HMSO.

Lay, R *et al.* (1991) *Marketing Requirements of the Profession*, Royal Institution of Chartered Surveyors, London.

Lewis, J and Cheetham, D W (1993) The historical roots of current problems in building procurement, *proceedings of ARCOM 9th annual conference*, Exeter College, Oxford, September, 50-61.

McDermott, P and Jagger, D (1996) A Strategy for Exploration of Procurement - Seven Years of CIB Working Commission W-92 - Procurement Systems, Paper presented at *CIB W-65 Symposium*, University of Strathclyde, 2nd September.

Moore, R F (1984) Response to change - the development of non-traditional forms of contracting. UK: *CIOB Occasional paper No. 31*, Sept.

NEDC (1990) *Construction: Restructure to Win*, Report published by the Construction Industry Sector Group of the National Economic Development Council, 14p. UK.

Oglesby, C.H. (1990) Dilemmas Facing Construction Education and Research in 1990s, *Journal of Construction Engineering and Management*, Vol. 116, No. 1, March, 4-17.

Ofori, G. Hindle, R.D. and Hugo, F. (1996) Improving the Construction Industry of South Africa: A Strategy, *Habitat International*, Vol.20, No.2, 203-220.

Patchett, J.M. (1980) Site Management Development, MSc. thesis, Heriot-Watt University.

RIBA (1992) Uplifting architecture: Strategic Study of the Profession, *Building*, July.

Rainbird, H. (1991) Labour Force Fragmentation and Skills Supply in the British Construction Industry,in Rainbird, H. and Syben, G. (eds), *Restructuring a Traditional Industry: Construction employment and skills in Europe*, Berg, Oxford.

Ramsay, W. (1989) Business objectives and Strategy, in Hillebrandt, P.M. and Cannon, C. (1989) *The Management of construction firms: Aspects of theory*, UK, Macmillan, London.

Saint, A. (1983) *The image of the architect*, Yale University Press.

Streeck, W. and Hilbert, J. (1991) Organised Interests and Vocational Training in the West German Construction Industry, in Rainbird, H. and Syben, G. (eds), *Restructuring a Traditional Industry: Construction employment and skills in Europe*, Berg, Oxford.

Trench, Sir P. (1980) Building in the 80s, *Building Technology and Management*, January.

Young, B.A. (1989) Building engineering route to construction management, *Chartered Builder*, September/October, 33-36.

Young, B.A. and Duff, A.R. (1990) Construction Management: Skills and knowledge within a career structure, *The Journal of CIB*, No.3, 183-185.