

# EXCORIATING THE TRUTH BEHIND THE STUDENT RECRUITMENT CRISIS: A COMPARISON BETWEEN CIVIL ENGINEERING AND BUILDING CONSTRUCTION COURSES

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Graduate civil engineering and building degree students provide an invaluable source of professionally qualified managers and engineers into the UK construction industry. Without graduate entrants, the quality and efficiency of the industry (and projects within it) would be severely affected in the future. Unfortunately over recent years, the number of undergraduate applications to civil engineering and building courses has been in decline. Using applications data obtained from the Universities and Colleges Admissions Service (UCAS), recent research work has accurately modelled this decline using quadratic model equations. This paper aims to build upon this a priori research by presenting a comparative analysis between the two student cohorts. Results reveal great synergy between the two sectors and point towards a major crisis in student recruitment. A discussion of possible reasons underlying this observed trend is provided together with constructive suggestions for reversing it. The paper suggests that a more holistic approach is required which embraces all sectors of the industry; academic, practitioners and professional, if the future of the industry is to be secured.

Keywords: crisis, forecast, graduates, recruitment.

## INTRODUCTION

Between 1994 and 2000 there has been a rapid increase in the number of applicants accepted onto HE courses (UCAS, 2002b). Research by Dainty and Edwards (2003) estimate this rise to be over 20%. This quoted percentage figure seems to be broadly in line with the Government's widely publicized target of increasing participation in Higher Education (HE) up to 50% for 18-30 year olds by 2010 (DfES, 2003). Nevertheless, whilst HE course applications continues to grow, construction course applications are in decline. In his recent review of research and innovation in the industry, Fairclough (2002) commented upon the delimiting effect that falling undergraduate admissions on construction courses would have on the industry's future development. He commented that:

"... there has been a dramatic decline in the numbers of new entrants on construction-related degree courses. If the current rates of decline were to continue into the future, the number of students in the built environment would rapidly collapse. By 2009 the number of applicants to civil engineering courses would have fallen to 0, while the last applicant to building and construction courses would enter university by 2012. So far, the declining trend line shows little signs of bottoming out."

At present, the UK construction industry is enjoying its best period of sustained economic growth since the late 1980s. This buoyancy however, is putting considerable strain on the construction labour market to cope with increasing skills demands. This paper presents an analysis of construction degree applications trends and reconciles this against future predicted growth within the sector. It explores whether graduate skills shortfalls threaten the industry's ability to improve performance and customer satisfaction. Finally the paper strives to determine whether concerns over falling applications to undergraduate construction courses are justified or purely speculative conjecture.

## **GRADUATE DEMAND AND PROVISION WITHIN THE UK CONSTRUCTION SECTOR: THE NEED FOR FURTHER ANALYSIS**

In recent years, the supply and quality of construction graduates have been scrutinized within the industry's trade press and academic journals following a reported decrease in the number of degree level applications (see Clarke and Wall, 1998; Knutt, 1997a; Ford, 1997; Building, 1996; Agapiou *et al.*, 1995). The observed shortage of construction graduates is by no means restricted to the building sector. Cavill (1999) for example reported on the paucity of quantity surveying graduates entering the industry in 1999 in comparison to the early 1990s. She found that on some courses the number of applications had declined by almost 75%. Similarly, Byfield (2001) reported on the steady decline in admissions to UK civil engineering degree courses coupled with an inevitable rising demand for graduates as supply is curtailed. These and other report findings have raised serious concerns that the number of construction graduates will not meet demand over the next few years.

The longer-term impact and severity of the decline in recruitment to undergraduate construction courses remains uncertain. However, most reports and industry commentators suggest that the future competitiveness and capacity of the industry will be reduced significantly. The initial signs of demise are evident by reports emanating from satellite construction sectors (for example, the water, road, railways and nuclear energy) who have expressed deep concerns that a rapid injection of suitably equipped personnel, consultants and contractors is urgently needed to cope with future workload (Mylius, 2001). Falling numbers of construction students are expected to militate against the ability of consultants and clients to gear up for the massive transport growth over the next decade. In turn, this could in turn undermine the Government's delivery of its 10-year transport plan (Oliver, 2000). The decline in the popularity of construction courses could also reduce the industry's ability to improve performance in line with the demanding targets set out within the *Accelerating Change* reports (Strategic Forum, 2002).

Despite the obvious concern within the industry over graduate shortages, much of the industry's basis for debate and speculation to date has been founded upon anecdotal evidence of falling enrolments, pure speculative conjecture and the threat of course closures emanating from some academic institutions (see Barrick, 2001; Ross, 2001). Little factual evidence exists as to the severity of the downturn in applications to construction courses. This inadequacy of information has made it difficult to accurately forecast the likely implications for the industry and HE, or the importance of marketing the sector more effectively in the future. Accordingly, this paper presents research which analysed HE applications and admissions data to construction-related courses. The work had two fundamental aims. Firstly, it sought to establish whether

reports of a student 'recruitment crisis' reflect a genuine problem for the sector, or merely isolated examples of declining admissions within certain institutions. Secondly, it aimed to establish whether the current recruitment crisis is likely to impact on the industry's ability to continue to improve its performance. This secondary aim is explored by forecasting future trends in graduate recruitment and reconciling this against industry growth predictions.

## METHOD

Data were collected from the Universities and Colleges Admissions Service (UCAS) of applications and enrolments to all building and civil engineering degree courses under the 'K2' and 'H2' classifications. These include: building construction and technology, architectural engineering, building services engineering, facilities management, construction management, fire safety, building surveying, building economics, quantity surveying, civil engineering and hybrid combinations of these subjects. Data are presented for a six-year period from 1994-2000. This reflects the period for which such statistics have been collected and processed by a single admissions body, thereby ensuring the consistency of the figures presented. Based upon this data, an exploratory analysis in applications and admissions to construction degree courses was undertaken.

To determine the relative movement of student applications and construction economic activity each year's cohort of students and total building output (billions of Euro at 1998 prices) were transposed into a relative index; where the base year (1994) had a value of one. Reducing two different scales of measurement to the same unit (that is, the relative index) meant that a graphical representation which includes both measures could be produced in order to facilitate a qualitative comparison to be made. Given the scarcity of data observations, a quadratic equation was employed to extrapolate future graduate trends and is expressed mathematically as:

$$Y = b_0 + b_1t + b_2t^2 + \varepsilon$$

Where:  $Y$  is the prediction;  $b_0$  is the constant;  $b_1, b_2, b_3$ , are the coefficients at time  $t$ ;  $t = 1$  in 1994; and  $\varepsilon$  is an error term.

**Table 1:** Key Statistics for Building Courses (UCAS (2000b) and Euroconstruct, 2002)

Year	Building Applicants (no.)	Building Applicants Index	Total Building Output (billions Euro at 1998 Prices 1 Euro= 0.6776)	Building Output Index
1994	8,546	1	85.54	1
1995	8,335	0.97	85.47	0.99
1996	7,621	0.89	87.43	1.02
1997	7,277	0.85	90.05	1.05
1998	6,911	0.80	91.59	1.07
1999	6,305	0.73	93.42	1.09
2000	6,178	0.72	95.94	1.12

## RESULTS

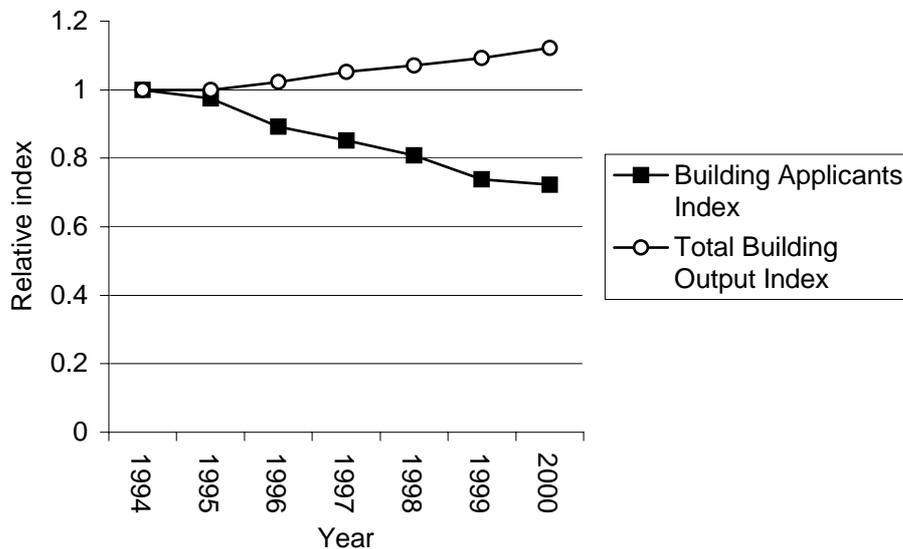
In order to examine trends in applications to construction courses in the context of overall university admissions for the period in question, the overall number of applications and applicants accepted to all courses were examined. Tables 1 and 2 illustrate a steady, almost linear decline in the number of students applying for both building and civil engineering degree courses since 1994. Further analysis of individual programmes shows that the fall in applications can be seen to be broadly

consistent (in percentage terms) for all subjects within the two classifications studied, with the exception of architectural engineering, which has increased slightly through this period.

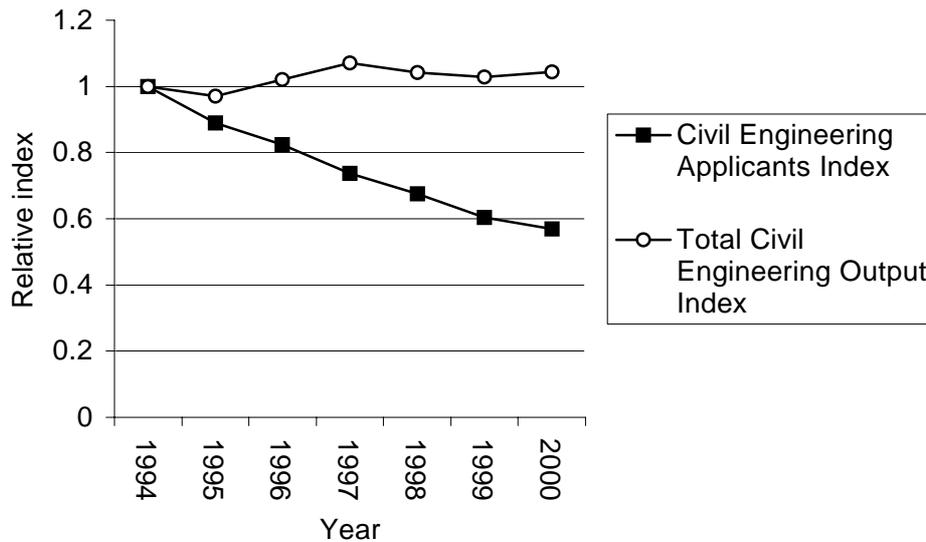
**Table 2:** Key Statistics for Civil Engineering Courses (UCAS (2000b) and Euroconstruct, 2002)

Year	Civil Eng. Applicants	Civil Eng. Applicants Index	Total Civil Eng. Output (billions Euro at 1998 Prices 1 Euro = 0.6776)	Total Civil Eng Output Index
1994	5,104	1	13.82	1
1995	4,538	0.88	13.41	0.97
1996	4,207	0.82	14.09	1.01
1997	3,766	0.73	14.79	1.07
1998	3,442	0.67	14.40	1.04
1999	3,080	0.60	14.21	1.02
2000	2,905	0.56	14.41	1.04

Comparing the decline in the numbers entering construction courses over this period to industry output (Figures 1 and 2) reveals that, during the same period (1994 to 2000), building and civil engineering output has continued to grow. Given this output growth, it is likely that the industry’s demand for professionally qualified graduates will increase. Although the observed decline in building applications is of concern (with an index value of 0.73 in 2000, compared to 1.0 in the previous year), the decline in civil engineering is far more acute (with an index value of 0.56 in 2000, compared to 0.60 in the previous year). This represents a decline of almost 50% in the number of civil engineering applications.



**Figure 1** – Applicants vs. Total Construction Industry Output for Building Courses (Source: UCAS (2000b and Euroconstruct, 2002)



**Figure 2** – Applicants vs. Total Construction Industry Output for Civil Engineering Courses (Source: UCAS (2000b and Euroconstruct, 2002)

## FORECASTS

Following preliminary data mining, the future trend in building and civil engineering degree applications were modelled.

### Building degree courses

For building courses, the model derived was expressed as:

$$Y = 9137.57 + -511.31(t) + 10.9048(t^2)$$

With an R<sup>2</sup> and Mean Absolute Percentage Error (MAPE) value at 0.984 and 1.04 respectively, the model appears to be both a valid and reliable predictor of student applications. Using the quadratic model developed a forecast for the next five years was derived viz:

2001: 5744.997

2002: 5419.069

2003: 5114.95

2004: 4832.641

2005: 4572.141

These five values suggest a gradual reduction in student applications over the next five years.

### Civil engineering degree courses

For civil engineering courses, the model derived was expressed as:

$$Y = 5,622.00 + -560.79(t) + 24.2143(t^2)$$

With an R<sup>2</sup> and Mean Absolute Percentage Error (MAPE) value at 0.998 and less than 1% respectively, the model was also proven to be both valid and reliable. Using the cubic model developed a forecast for the next five years was derived viz:

2001: 2,685.39

2002: 2,536.24

2003: 2,435.53

2004: 2,383.24

2005: 2,379.37

These five values also point towards a further gradual reduction in student applications.

## DISCUSSION

The preceding analysis provides demonstrable evidence of a recruitment crisis within construction degree HE in the UK; this despite the expansion of the HE sector generally and the growth in construction economic activity. The observed trends reveal that there has been a year-on-year decline for virtually all building-related degree programmes since 1994. Current entrance to programmes has also declined but to a lesser extent, inferring that UK universities are maintaining recruitment levels from a narrower recruitment base. A reduction in entrance standards could have negative implications in terms of the calibre of graduates entering the industry. This hypothesis is supported by anecdotal accounts and speculation within the trade press of the lower quality of construction graduates currently available, despite the lucrative salary packages being offered (Lawson, 2000). When this observed decline is compared to the expansion witnessed throughout HE (a sector that has doubled in size over the past 20 years and continues to show signs of further growth), the results provide factual evidence to support the concerns of industry's professionals and employers.

The declining popularity of building and civil engineering occupations could impact upon the industry's future development and therefore, affect its ability to compete with stronger international rivals. Knock-on ramifications could include an increase in graduate salaries as firms compete for a decreasing cohort of able graduates. Simultaneously, those experienced professionals who are already employed within the sector may be 'poached' by competitor firms who may offer greater fringe benefits and remuneration packages. Market growth coupled with tight labour market conditions is ultimately likely to impact upon the cost of construction projects (Agapiou *et al.*, 1995).

Possible causes for the decline in recruitment to building courses remains an enigma, although the findings suggest that the industry has a fundamental image problem in attracting school leavers. Historically, the industry has a low-level image, being synonymous with high cost, low quality, chaotic working practices and a poor health and safety record (Ball, 1988). These perpetual problems stimulate the perception that career opportunities within the industry are poor (Baldry, 1997). Consequently, there is an overwhelming need to improve the industry's image if new recruits are to be attracted and retained (Griffith, 1988). Securing the future of educational provision for building requires a universal remedy as educationalists alone cannot solve this conundrum (Griffith, 1988). An all-encompassing partnership between HE institutions and the industry is needed to reverse the current trends. Construction companies and construction HE departments should embark on an immediate and sustained promotional campaign if future recruitment difficulties are to be avoided. Campaigns such as *National Construction Week* have begun to raise awareness of the industry amongst teachers and pupils. However, career opportunities within construction must continue to be actively marketed within schools if they are to have a long-term effect on the popularity of the industry as a career choice.

In addition to improving the industry's image, avoiding serious skills shortages also demands that a high proportion of construction graduates are retained. Evidence suggests that the industry has begun to realize the importance of retention following explicit references made within the *Respect for People* report (Rethinking Construction, 2000) and the launch of the CITB's industry-sponsored 'Design-a-job' website in 2001. *Design-a-job* is specifically aimed at ensuring that construction graduates enter the industry upon completion of their courses. In terms of those graduate managers already working in the sector, the scarcity of experienced managers will undoubtedly place more emphasis on the need to increase the quality and quantity of training in order to produce more effective workers (Levy, 2000). Investing in people working in construction should help to mitigate skills shortages through improving their capability and productivity. In addition, training may offer opportunities for redeploying non-graduates to management positions that may have otherwise been filled by new graduate entrants.

A possible solution for construction HE departments would be to rationalize their course provision through the development of common programmes of study. Academics and industrialists alike have long advocated the concept of developing more commonality across construction courses as it offers advantages in lower staffing commitments, and of promoting interdisciplinarity amongst building students (Allen and Croome, 1993, Russel, 1993; Harris, 1991; Haenlein, 1990). Alternatively, to the industry could choose to recruit a greater number of "non-cognate" graduates; i.e. those from non-construction first degree disciplines. Indeed, some sections of the industry appear to have adopted this approach in order to address the shortages within their own disciplines. For example, the CIOB has recently devised a scheme to accredit non-construction courses in a bid to widen access to semi-cognate graduates (those from construction-related disciplines such as housing and town and country planning) and non-cognate graduates to building occupations. Special 'top-up' courses are being devised which will equip students with the necessary technical qualifications, skills and experience for construction management (Construction Manager, 2001). However, such initiatives are reactive and merely deal with the symptoms of the declining popularity of construction careers and fail to address the underlying causes of the current recruitment crisis.

## CONCLUSIONS

This paper has explored whether the current supply of building graduates will meet the growing demand for young construction professionals in the UK over the next few years. Using UCAS data, quadratic equations generated forecasts that anticipate further reductions in building degree applications until 2005; this despite a concurrent growth in sector economic activity. Whilst predictions of a continued steep decline must remain tentative given the limited data available, these forecasts raise fundamental questions. In particular, they call into question the industry's ability to attract high quality graduate entrants in order to maintain its position at the top of the global performance league tables. These trends also contradict the expansion of HE generally, which suggests that the industry is facing a considerable challenge in adapting its public image to make itself more attractive to high achieving school leavers. If the industry fails to address the declining enrolments to construction courses, then a series of negative knock-on effects will result. These include a spiral of lower quality entrants to construction courses, fewer graduates entering the industry, skills shortages for management positions and eventually increasing wage costs.

A positive correlation exists between the quality of graduate entrants and the industry's image and profile. This can be seen in other professions such as law and accountancy, and even in some construction professions such as architecture, which continues to recruit a proportionately higher number of undergraduate applications to its courses. Thus, there must be an immediate campaign to raise the industry's profile and public awareness of construction professions. Such an undertaking should involve a partnership between the industry and construction higher education departments aimed to attracting and recruiting students to civil engineering and building courses.

The industry now faces an alarming dilemma in that whilst an increase in output is apparent, professional candidates, equipped with suitable degrees, are not being attracted to the industry. It is apparent that further reductions in student applications are to be expected, and so immediate action is therefore required to arrest the current trends and enhance the industry's future prosperity. These actions should centre around the promotion of the profession as an attractive career, especially to those groups currently underrepresented who provide the greatest potential pool of new entrants. Regardless of analysis and conjecture, it seems clear that the profession has an uphill task if it to reverse the declining interest in construction degree courses

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