SUSTAINABILITY OF CONSTRUCTION EDUCATION

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Introduction and Background

Construction is changing, as Heraclitus anticipated in the latter half of the sixth century B.C., when he said "no-one can step twice into the same river, nor touch moral substance twice in the same condition". Thus everything changes, and as Handy observed (1989) "change is constant".

The following illustrate a few recent changes in relation to construction materials, methods, and management:-

- New materials have been developed such as EPDM and Teflon-coated roofings, photo-chronic and other forms of responsive glazing, microporous paints and self-healing finishes.
  At the same time there has been a resurgence in interest in 'old' or 'traditional' materials such as earth and turf, and in recycling materials.

- Construction methods have moved seemingly inexorably in the direction of greater mechanisation, including in UK with encouragement from the Egan Task Force (1998) a renewed interest in prefabrication which had been in the doldrums since the collapse of Roman Point in 1969.
  This trend however is being challenged by the developing agenda for more labour intensive construction as exemplified by work of the Research Centre for Employment Creation in Construction at the University of the Witswatersrand reported at a recent CIB Symposium (McCutcheon, et al, 1999).

- Management in and of the construction industry has been influenced by changes in general management theories and techniques. The work of Charles Handy has already been referred to, and he is but one of hundreds of so-called 'management gurus'. Construction organisations have submitted themselves to de-layering, downsizing and re-engineering, and are currently addressing partnering. Loosemore (1999) has questioned such 'management fads'.

There have also been changes in built forms with the development and adoption globally of the 'skyscraper', the 'business park' as successor to the industrial estate, and the edge-of-town supermarket superseding the corner shop.

Building standards, as represented by Regulations and Codes, have been increasing as living standards have risen, and more aspects of construction controlled. For instance in UK regulation of thermal insulation was introduced in the 1970s and has been progressively improved at intervals since.

However, while standards 'on paper' may have improved, there remains indications that work on site does not always measure up. For instance at the launch of the UK Construction Quality Forum in November 1993, the Building Research Establishment (BRE) reported that "each year, defects or failures in design and construction cost members of the construction industry more than £1,000 million (Latham, 1994, p.79). Latham and Egan, and many before them, have suggested a target of zero defects, constructing right first time.

There are related concerns that construction craft skills may not be available in the quantity of quality required. A study carried out in Oxfordshire, UK (Wood, 1999a) showed that not only were traditional skills in bricklaying and carpentry in short supply

but that there were serious shortfalls in IT literacy and business skills.

A study by the UK Construction Industry Training Board estimated that an increase in formal places of around 25% over the years 1999-2003 would be required to meet shortfalls (CITB, 1999).

This situation is influenced to some extent by an increased rate of "staying on" at school beyond the official school leaving age of 16 years. The UK government has been encouraging students to stay on and to aim for university, and this has resulted in less young people available for craft training. (CIB, 1998, p.18).

At the same time there is increasing demand for higher qualifications in construction. Whilst there has long been an expectation of degree level education for a chartered surveyor or civil engineer, degrees in construction management are relatively younger, and it was only from 1994 that the UK Chartered Institute of Building (CIOB) has expected its candidates for professional membership to come through accredited honours degree courses.

There has also been growth in post-graduate education; such courses are important for the profile and zone of universities and for the subject areas within them. Within an industry where there are many in management positions, or aspiring to them, without graduate level qualifications there is a potential market to be served. For these people, undergraduate courses are unattractive, requiring several years of study and disruption, whether studying full-time or part-time, to achieve a qualification only the same as new entrants to the industry. By contrast, candidates with several years of industrial experience are welcomed onto postgraduate courses which are normally completed in one or two years, arranged possibly with short block visits for teaching and tutorials, and with a focus on self-directed learning. Often such students find this kind of study, its level and quality of organisation required, especially time-management, more demanding than anticipated. These problems have been discussed in previous work by the author (Wood et al, 1998). Although not covered further here, such issues may contribute to the sustainability or otherwise of particular forms or formats of education provision.

The poor image of construction is also an inhibition to people deciding to take up construction education. Although efforts are being made to redress this, for instance in the UK through the setting up of a pan-industry National Construction Careers Group, it is likely to be some time before construction careers will have the cachet of those in medicine and law.

The fragmentation of the construction industry as observed by Latham and Egan is also unhelpful to construction education as it is reflected in recruitment to separately defined courses for each of the professional disciplines. The disciplines seem to find it as difficult to study together as they do to work together, although there is hope through "common learning outcomes" promulgated through the UK Construction Industry Board (CIB, 1996).

Each of these issues impinges upon the sustainability of construction education. Implications for future development are discussed under three main foci:-

- the construction education market
- satisfying needs: students as customers
- courses of action

Markets

Construction education has a creditable tradition of serving constructing industry through courses designed to meet its needs at a range of levels through a variety of modes.

The vocationality of construction education has been both a strength and a drawback; there are few who will study construction without expecting to pursue a career in the construction industry.

A study of construction academics (Boshoff-Wood, 1996) identified that around half of them did not see themselves as part of the construction industry.

Employability is a significant issue. Course design will often include employers as part of the development team and/or as advisors, and they will be represented on validation, accreditation and quality assessment panels. Course content and delivery modes are expected to be industrially relevant.

There is a long history in construction, of study through 'day-release' programmes. Thus many construction courses are already contributing significantly to universities' missions as they endeavour to provide more diverse routes through higher education. There is also a significant proportion of mature students on construction courses, helping universities provide broader access to higher education.

Full-time students of construction are also generally expected to undertake a period of at least nine months of "industrial training", which is often seen by students as the time in which they learned most, relating theory to practice and vice versa. This 'sandwich' course approach is highly valued by students and employers, and in this way both are kept up to date with developments, and this informs course content and curriculum, and contributes to sustainability.

This experience with undergraduate and sub-degree programmes has helped inform the development of postgraduate or Masters Level courses. As the undergraduate market has matured and become saturated, especially as demand shrinks at time of recession in the construction market, so there has been increased focus on Masters course developments, which are also seen as an important contributor to "profile", and status within the academic framework.

It is not yet certain that there is a sustainable market for Masters courses, but that does not appear to be inhibiting their development.

There is certainly a substantial body of people undertaking roles in the industry for which a Masters level qualification would be appropriate; and the industry would benefit from more people better qualified in strategic planning, leadership and direction of the firm. However, 'the jury is out' on how many of these have the 'right stuff' for successful study at this level.

Courses have certainly been designed to appeal to this market and to facilitate study by construction managers. Programmes are generally modular and offer a hierarchy of qualifications through Certificate and Diploma to Masters, although often the 'intermediate' qualifications are seen as 'fallbacks' for students unable for whatever reason to see the course through. In the UK, this apparent "compensation for failure at another level" is proposed to be disallowed (QAA, 1999). Credit is normally available for prior learning either by previous study or by experiential learning; these are attractive attributes for students trying to minimise the duration and costs of their studies.

Flexibility and Open Learning are also watchwords, enabling and encouraging students to bring to bear their often extensive experience to their benefit and that of their fellow students in discussing alternative approaches and solutions to problems they may have had at work.

At the same time, some institutions have invested in trying to reach a wider market through the use of Distance Learning material, particularly in endeavouring to reach previously unreached markets, for instance in East Asia.

Whether such approaches are sustainable is also open to question, for instance if substantial workbooks or their modern web-based equivalents are to be created and kept up to date.

The size of the global market may be helpful – it is certainly seductive – but global competition can be fierce and the recipe for success is uncertain. Whether this market can be reached and served successfully is not yet proven, let alone whether this form of educational provision is sustainable.

A number of issues related to the use of electronic media in a Masters course have been discussed by the author elsewhere (Wood, 1999b).

Students as Customers

The profile of construction students in terms of age, entry qualifications, gender, etc is not 'typical' of university students generally. Few UK construction management students come direct from school with GCE 'A' Levels; these are generally a minority. Broadly similar numbers of undergraduate students come to university after completing construction courses at further education college having left school at 16 rather than 18 years of age, or as mature students from industry with qualifications gained some years previously or with no formal qualification.

However, the withdrawal of student maintenance grants and the requirement to pay fees is bringing changes to the nature of the 'contract' between the student and the education provider. Students must be expected to become increasingly demanding and discerning and attention will need to be given to disparate and differing needs.

Increased competition for students may also be expected as institutions look to retain and enlarge their market. It will be important for institutions to 'sell' their courses, but not to 'over-hype' them. To take on too many students, or too many that are under-qualified or under-equipped to cope with the course, or students with unrealistic expectations, must be expected to bring problems in service delivery and dissatisfaction.

Seeing students as 'customers' with rights and expectations to be satisfied may be difficult enough for some, let alone actually achieving customer satisfaction.

How sustainable will courses be in this customer focused context when they were designed to meet criteria determined by providers who 'knew best'?

Satisfying Needs (or Wants?)

It has been said (Kotler et al, 1996) that "Marketing must be understood not in the old sense of making a sale – 'selling' – but in the new sense of satisfying customer needs".

So what is the 'need' for construction education? And does this differ from 'wants' for construction education? There may be serious mismatches between what the construction industry needs and what students want. Struggling with structures and scientific calculations are such areas of conflict.

Identifying needs is a necessary prerequisite to trying to meet them; this needs market research, something to which universities have not traditionally needed to apply themselves a great deal.

As new courses are developed, and existing courses reviewed, their marketability will need to be assessed. Endeavouring to open a course up to 'market segments' not previously targeted or served may mean significant changes in direction.

Items to address will include for instance:-

- course content
- sequence and status of material
- assessment regimes
- delivery modes
- accreditation needs

In relation to content for instance, sustainability is definitely an important global issue at this time; however it is suggested that courses with the word 'environmental' in the title are attracting

less applicants than previously; more investigation would be warranted here.

Regarding course structures and organisation, modularity has facilitated students being able to "mix-and-match" and pursue a personalised programme. Module content has to be considered in the context of what a student may or may not have already covered. Increasingly, module leaders are in competition, seeking to maximise take up of 'their' module by making it 'sexy'.

There are also effects on assessment regimes. Examinations may not be popular with students, but they can be more "resource-efficient" with regard to staff-time in marking them by comparison with coursework assignments that may represent the result of many hours of student effort. On the other hand, an examination directly on the end of a short block visit may be more "time-efficient" for a student than trying to 'find time for' and 'fit in' the research necessary for a satisfactory and satisfying piece of coursework.

There may also be conflicts between student wants and the demands of accrediting professional bodies. There is often perceived pressure from the latter for a fuller and more prescriptive syllabus, which may cut across the facilitation of a student's wish, or want, to pursue a particular area, and for which he or she is "paying good money".

Review of course content is a familiar and routine exercise. Syllabi are regularly revisited and it would be an exceptional course that had not for instance incorporated 'sustainability' somewhere into it. In the current marketplace irrelevant syllabus would be unsustainable.

Some institutions have responded to the marketplace by developing online web-based courses. In a commercially competitive world it is difficult to obtain definitive figures on costs and returns on investment. However, a study at Kansas State University, comparing a distance learning course with the on-campus course from which it was developed concluded that "…based on 1997 enrolments, variable costs such as faculty time per student are larger and revenues per course are smaller for distance learning relative to on-campus instruction" (Burton, 1998). It is questionable whether the kind and level of input required to start up and maintain bespoke on-line teaching materials is sustainable. An on-line course on sustainability may make an interesting combination of medium and message.

Information technology more generally offers a range of opportunities, including for instance 'Renewable Learning Resources'. The author's experience in this field using existing online databases, websites and mailing-lists suggests this is a viable and effective vehicle for facilitating sustainable construction education.

Courses of Action

The relatively new and developing context of a more discerning and demanding student is driving a response that features a greater apparent student - centredness as a route towards a greater certainty of customer satisfaction.

The benefit of learning by doing, as opposed to just listening to 'teacher' or note-taking, has long been recognised.

It is also suggested that learning from mistakes is significant. As Samuel Smiles put it (1859) "We learn wisdom from failure much more than from success. We often discover what will do by finding out what will not do; and probably he who never made a mistake never made a discovery". Governments and others trying to induce greater innovation and invention need environments created that are facilitative; some institutions will find this difficult.

Perhaps a relatively 'soft' way of learning is to learn from the experiences of others, including their mistakes. Universities are currently much focused on research and

publication; a 'student-centred' agenda can be aligned with this. Sometimes this student-centredness is expressed as the 'BOFO' Model, where the student is encouraged to 'Go Away and Find Out'.

At its crudest this model may suggest a student finding out in a library that which a lecturer may otherwise have delivered, but that is to neglect much of the opportunity.

A 'Learning Contract' where an individual student negotiates his or her own learning has much to commend it. In essence the student identifies a topic, how he or she intends to investigate it and what the outcome will be, and agrees this with the tutor. This 'contract' could be renegotiated if necessary along the way.

The author's experience with learning contracts indicates that students are well-motivated by the method – they 'own' the project – and that the approach is capable of producing good and interesting outcomes. To an extent, the students become 'researchers' (and they learn from the process as well as the product) and potentially help tutors and other students by identifying material previously unknown and sometimes creating new material through investigation of their employer's perceptions and practices.

This approach has encouraged a focus on current thinking and practice rather than a reliance on material already published. Whilst this may put a strain on electronic resources, it relieves pressure on paper-based materials.

A downside may be a tendency to pay less attention to historical development, context and theoretical underpinning. Thus while the 'learning contract' or BOFO method may be sustainable from resource or delivery standpoints, there may be concerns around sustainability of quality outcomes. While it is notoriously difficult to confirm or refute suggestions that students are not "what they used to be", feedback from employers has confirmed that useful outcomes have been achieved, that students have produced material that they value and that the students have themselves developed through the process.

Conclusions

Construction is changing, and so is the market for construction education. Construction education providers are responding to this changing context, recognising students as customers to be valued and satisfied.

Courses need to be designed and reviewed in the context of what and how students want to study. This is likely to have an increasing influence on course content and delivery mechanisms.

The 'BOFO' principle, by which students are encouraged and enabled to 'go away and find out' what is needed to meet a learning outcome which he or she has negotiated with a tutor (and possibly their employer too) is capable of producing good results, using renewable resources and delivering sustainable construction education.

More information is required on the costs and benefits of distance and on-line educational forms and the author would be keen to participate electronically and face-to-face in an exercise to bring together such global experiences.

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