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UK Computer Science Degree Accreditation: A Post-Shadbolt Review Update

ABSTRACT

The assurance of quality through degree accreditation by Professional, Statutory and Regulatory Bodies (PSRBs) is very much a feature of higher education in the UK. In this dynamic and emerging UK educational, economic and policy environment, there still remains a need for accreditation regimes to evolve in order to maximise the value they provide to higher education institutions, as well as to industry and society as a whole.

The Shadbolt review, an independent review of computer science degree accreditation and graduate employability conducted in 2016, focused on the purpose and role of degree accreditation, how the system can support the skills requirements of employers, and how the system can improve graduate employability. This paper provides an update in the context of one professional body – BCS, The Chartered Institute for IT – of what has happened in response to the recommendations of the Shadbolt review, focusing on ongoing enhancement projects, as well as commentary and recommendations for future activities and initiatives.

CCS CONCEPTS

• **Social and professional topics** → **Accreditation**;

KEYWORDS

Accreditation, Computer Science Education, Curricula Design

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1 WHAT IS IT?

The Shadbolt Review [19], published in May 2016, investigated the relatively high unemployment rates graduates of computer science and related degrees in the UK and the role of degree accreditation in promoting employability. The Shadbolt review noted that the disparity in 'raw' unemployment rates was largely accounted for by prior achievement and socio-economic factors, and that rates of graduate unemployment were declining and varied considerably between geographic location and type of HEI. The discipline was already acting proactively to address the issue. Related professional bodies have enhanced their accreditation processes in response

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these challenges. BCS has made significant adjustments to their accreditation processes since 2015; these were partly in response to the discussions related to and the recommendations of Shadbolt but also to other changes in the sector and the discipline. These have been communicated to the assessor community and to those responsible for leading the development of HEI accreditation applications. However, there are many academics who are less intimately involved in accreditation: this paper serves to communicate these and future enhancements to them and the wider computer science education community.

2 WHY ARE YOU DOING IT?

The Shadbolt review [19, p. 8] makes two main recommendations for the enhancement of accreditation regimes, one related to the Academic Accreditation of Degree Courses and the other related to Engaging Industry in Accreditation. Criticism of the accreditation of degree programmes is not new. There is a history of claiming the processes are unnecessarily bureaucratic and constrain innovation [11], and there are dangers of accreditation streams being revenues streams in their own right rather than for the benefit of a discipline or wider society [13]. Equally its value has been highlighted particularly in the context of a potentially globally mobile workforce [13]. Hence, the challenge set for BCS and other accreditation providers that operate in the Computer Science discipline is broadly to: increase awareness and value of accreditation; focus upon outputs; maintain internationally recognised standards; respond to emerging technology trends and developments; promote enhancement and innovation; engage industry; and reduce the perceived bureaucracy involved.

3 WHERE DOES IT FIT?

In the United Kingdom the most common form of accreditation in the Computer Science and related discipline areas is by professional bodies. BCS, The Chartered Institute for IT (BCS) and the Institution of Engineering and Technology (IET) are the main bodies involved. The accreditation provided by these are underpinned by international initiatives such as the Washington Accord [2, for CEng] and Seoul Accord [1, for CITP]. These memoranda support the internationalising of the curriculum and promote consistency and parity in Computer Science education globally.

In accreditation IET and BCS broadly check two things [4, 15].

- (1) Are the exit standards of the programme appropriate to support accreditation? A number of standards are considered including entry, progression, retention, awards and graduate employability. This is supplemented by other evidence of the quality of the provision, for example external examiners reports, the most recent subject review, annual review information, evidence of employer involvement, linkage with research. Together these evidences that a programme is of an appropriate quality to support accreditation.

- (2) Are the curricula exit standards of a programme consistent with the learning outcomes expected for the accreditation sought? The expected exit standards should conform with the international memorandum (Washington or Seoul Accord or both).

BCS is addressing the recommendations of the Shadbolt Review in the following ways.

3.1 The value of accreditation

What is the value of an accredited degree? BCS is in the process of initiating a conversation to explore the value proposition of accreditation from the point of view of other stakeholders. The following are aspects of the value.

3.1.1 Raising output standards. BCS can and has refused accreditation for programmes that are not of an appropriate quality for accreditation. However, an enhancement-oriented rather than prescriptive approach is adopted. Quality is considered on a holistic basis. In response to the Shadbolt two criteria were introduced. These are "% of graduates in related professional 6 months after graduating" [3, p8] and "A 1.1.6 Describe how employability skills are developed within the students and how students are supported in their professional development" [3, p3].

3.1.2 Promoting internationally agreed standards. The BCS accredits to internationally agreed standards, which evidence the global parity of the degree programmes accredited. BCS refuses accreditation when achievement of the curricula exit standards for the accreditation sought are not met. This assists in the global mobility for the graduates of accredited programmes. Part of the value here is linked to the value of professional registration. BCS currently has a project investigating how to enhance the value of professional registration to students, graduates and early career professionals.

3.1.3 Ensuring curricula relevance. With the agreement of the sector (normally reached through the Council of Professors and Heads of Computing (CPHC)), it is possible to agree and promote curricula change. The most recent example of this is the inclusion of cybersecurity in all accredited degrees [20]. BCS mandates the inclusion of security in all accredited degree programmes to a standard agreed between professional bodies, industry and government. BCS has been requiring coverage since 2015 [4, p. 17–18] with the result that all accredited universities must be compliant by 2020 (due to the five-year cycle of accreditation) [20].

This year's Royal Institution Christmas lecture considers ethical questions related to computing and mathematics [12]. This is a curricula element that has been mandated by BCS accreditation in the form of legal, social, ethical and professional issues for a number of years [5].

Group working experience is mandated by BCS (criterion 2.3.1 [4, p31]). This is extremely valued by employers, but typically disliked by students at the time, and features negatively in many student comments. Hence if UK universities, which are heavily judged by current student opinion, were left to themselves without accreditation, they would probably remove group working.

3.1.4 Disseminating good practice. BCS accreditation panels have been identifying aspects of good practice for wider dissemination for a number of years. Since 2016, the process has been refined to more clearly signpost commendations. BCS is currently in the process of refining the promotion of good practice. One short term initiative, from autumn 2019, visited HEIs will be offered the opportunity to showcase an aspect of their provision or practice. The intention is to generate further good practice examples that a visiting panel can potentially commend.

3.1.5 Industry relevance. All BCS accreditation panels include an industrial assessor whose role includes ensuring that programmes are providing high quality, up to date and relevant material that produce graduates who are able to enter a competitive employment market. Evidence that a visited HEIs' mechanisms for engaging with industry are supporting graduates to evidence they are achieving the expected exit standards are sought from a variety of sources including the curricula studied; the assessments and examinations sat; and the engagement mechanisms themselves.

3.1.6 Independent peer review. Peer review is commonly used in quality regimes in higher education and in periodic review processes. In most cases the HEI being reviewed chooses the peer. As part of a BCS (or other professional body) accreditation a HEI has less choice regarding who completes a review and hence such a review is arguably more truly independent. BCS review panels contain a minimum of two experienced assessors who have strong awareness of the discipline norms across the UK sector.

3.2 Accrediting work experience

BCS has introduced accreditation to Professional Registration for IT Technicians (RITTech) as a mechanism for accrediting industrial experience gained during a placement, foundation degree or work-experience as part of a degree apprenticeship [4, p8]. This product development was introduced in response to Shadbolt.

3.3 Driving improvement

A number of data sources have been employed to help drive the improvement efforts. The Shadbolt report led to a number of enhancements. BCS Secretariat continually evaluate via the use of opinion surveys and informal conversations. Views are gathered related to briefing sessions, pre-visit communications and visits. Following a visit BCS panels engage in peer review. The feedback gained from these sources is explored and opportunities for enhancement agreed at accreditation committee meetings. Prioritised working groups then complete the enhancement projects.

3.4 Reducing bureaucracy/enhancing practices

A review of BCS Accreditation practice has been taking place since 2015 with the intention of adopting an enhancement-oriented agenda; reducing the amount of bespoke documentation that is required; using technology to assist the process, whilst enforcing the international standards. Working through the process from a visited HEIs prospective the review results in the following changes.

3.4.1 *HEI briefing.* For a number of years all visited HEIs have been encouraged to attend a briefing to explore the BCS requirements with a focus upon any changes since the last visit and common challenges. Attendance was understandably mixed, partly due to travel. Since 2017 all Briefings have taken place by video conference. Feedback upon this approach has been very positive.

3.4.2 *The application itself.* From a paper and memory stick / CD submission before 2015, BCS has moved to a fully electronic submission. BCS is flexible in how the information is provided, a range of secure cloud-based file sharing systems have been employed, submission via the use of Virtual Learning Environment has been completed and a minority of institutions have opted to create a website related to the submission. Most of the application consists of an evidence base which HEIs will already have. This is supplemented by a summary of the provision and each programme in which the department are welcome to reference existing resources. HEIs are still required to provide a mapping of where the BCS requirements are taught and assessed within each programme. This is required to evidence where the accreditation-specific requirements (such as security or ethics) are met in a particular programme.

3.4.3 *Areas for discussion at visits.* It is now normal practice for a BCS panel to communicate likely areas of discussion to a visited HEI prior the visit wherever possible (but HEI applications may be late or other issues can emerge as part of the visit). This has resulted in discussions tending to become more collegiate and supportive.

4 DOES IT WORK?

HEIs choose which programmes are submitted or not in an accreditation application. As such only a sample of provision may be considered. However, a proxy for success is the anonymous feedback BCS obtains post visit. Some key aspects of this feedback are shown in Table 1. Overall the results are positive, indicating the process is generally valued and shows the increased attendance of the virtual briefing over the physical one.

Table 1: Selected results from accreditation visit feedback survey

	2017	2018	2019
Responses	12	14	16
Attended pre-visit briefing	6	14	16
The visit felt to be worthwhile:			
Strongly Agree	92%	93%	88%
Agree	0%	7%	0%
Tend to Agree	0%	0%	6%
Strongly Disagree	8%	0%	0%
No reply	0%	0%	6%
Overall how satisfied with the visit?			
Very Satisfied	83%	86%	94%
Quite Satisfied	8%	14%	6%
Not Satisfied at all	8%	0%	0%

[20] shows that accreditation has driven Cybersecurity in the UK, as opposed to the US, where it is also in the recommended curriculum, but the corresponding accreditation requirements are much more recent.

5 WHO ELSE HAS DONE THIS?

In the UK for the broad computing area, in addition to IET and BCS providing accreditation a number of agencies provide endorsement. These schemes are commonly intended to promote employability of graduates. This bodies include Tech Partnership Degrees [10]; TIGA a trade association representing the UK’s games industry and Screenskills (formerly Creative Skillset) [18]; The Chartered Society of Forensic Sciences [17]; and the National Cyber Security Centre (NCSC) [14]. There is little published regarding the effectiveness or otherwise of these endorsements.

The Institute of Coding (IoC) is a not for profit organisation that intends to enhance how Digital Skills are developed in Higher Education in the UK [9]. A micro-credentialing approach is being taken to its proposed accreditation regime. This could potentially augment the current recognised pathways to professional accreditation by providing a more fine-grained alternatives that could be useful to some employers or employees who wish to evidence their achievements in an accredited manner. One of the challenges in this work is the lack of an agreed standard (in the way there is for the Seoul and Washington Accords) for micro-credentialing. The BCS is actively working with IoC and intends to collaborate with the IoC in any initiatives of mutual benefit.

The wider Computer Science discipline has also responded actively to the challenges presented by Shadbolt with CPHC operating four working groups [8]. The Royal Academy of Engineering Visiting Industrial Professor Scheme [16] has promoted further engagement between industry and academia.

6 WHAT WILL YOU DO NEXT?

As discussed earlier, BCS has initiated a conversation to explore the value-proposition of accreditation from other stakeholders points of view. The BCS is also exploring the value-proposition BCS professional membership represents to students, graduates and early career professionals. As indicated previously an industrial assessor is a critical part of every visit panel. There are also interesting developments being led by the IoC related to micro-credentialing. BCS will continue to consider opportunities for the further involvement of employers in accreditation. BCS is currently in the process of refining its processes for the promotion of good practice. In addition to these enhancements, there are number of enhancements either in progress or planned for the future which are considered next.

BCS accreditation primarily takes place in the UK, however there are a small but growing number of institutions outside the UK that BCS accredits. Under the terms of the Washington and Seoul Accords, BCS does not engage in accreditation in the jurisdictions of Accord signatories without first consulting with the related local professional body. On occasions BCS guidelines employ English / Welsh higher education terms without indicating that local equivalents are equally acceptable. The next set of guidelines will address this shortcoming.

In the British jurisdiction of the Washington accord, the approach adopted is unusual in that the Engineering Council extends the license to accredit *Chartered Engineer* to a large number of professional bodies [7]. This is not the practice adopted in other jurisdictions, for example in the United States of America ABET is the sole body. A recent audit by the Washington Accord has highlighted

divergence in practice in some areas with respect to Chartered Engineer Accreditation. The Engineering Council is in the process of seeking further consistency. This has led to the new rules with respect of Compensation and Condonement for Eng accreditation [6]. Further changes are embedded in Accreditation of Higher Education Programmes version 4 (AHEP 4). The BCS requirements have been updated to reflect the expectations of Compensation and Condonement. Once AHEP 4 is finalised further work will be required to address these updates. Among other proposals, AHEP 4 intends to extend Chartered Engineering accreditation to include diversity and widening participation data (of staff and students) as part of the metrics that assess the quality of provision. The Computer Science discipline could clearly do better in this regard, so this should be a positive inclusion.

There are considerable external pressures placed upon HEIs, by for example the Research Excellence Framework (REF) and the Teaching Excellence Framework (TEF), which could reduce the priority placed upon accreditation as a mechanism for supporting enhancement. BCS continues to review the bespoke documentation it requires and to make reductions when possible. Care is taken in visit reports to ensure positive aspects of provision are emphasised. This is in part intended to provide evidence that could be used to support future TEF related submissions. Discussions regarding the agility of processes are incorporated into two annual BCS Accreditation Committee meetings to identify enhancements.

As part of its operation BCS continually reviews and monitors the support process it employs for HEIs seeking accreditation and hence will continue to enhance processes in this area. There is a strong and vibrant community of academics and industrialists who actively participate in accreditation. However, there are many involved with whom communication could benefit from being more active. A number of initiatives are in process to enhance these communications. For HEIs there are ongoing discussion within BCS regarding establishing a periodic bulletin which could be used to share updates of accreditation practice / procedure, highlight HEIs having their first visit, sharing good practice examples, promote assessor recruitment and so on. Assessor Peer Review has indicated more regular communication with assessors could be of benefit. Virtual link up sessions for assessors are proposed. The BCS are in the process of contacting assessors to determine likely interest and thoughts related to relevant topics for such link ups.

7 WHY ARE YOU TELLING US THIS?

One of the recommendations of Shadbolt is the value of accreditation should be more clearly communicated to stakeholders; this paper is part of a set of initiatives to achieve precisely that. Much has changed in BCS accreditation in the last few years; for many academics, their only experience of BCS accreditation would be their quinquennial BCS accreditation visit. Accreditation by the BCS is performed by panels of BCS assessors, and an assessor may be an industrialist or an academic. The size of a panel varies depending upon the number of programmes a visited HEI is putting forward for consideration, but a panel will always include an industrial assessor and two or more academic assessors. HEIs will have at most two academic assessors from their staff. There is a large pool of academic assessors and as such not all assessors will

complete an accreditation visit every year. Conversely, not all HEIs have an academic assessor; hence a significant subset of the UK computer science education community are not informed regarding the evolution of accreditation practice. As such, the primary aim of this paper is to share to the wider community the recent developments, as well as the future enhancement aspirations and the opportunities to engage in shaping the wider research and policy agenda in this important area.

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