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

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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**; *Computing education programs*; Employment issues;

KEYWORDS

Accreditation, PSRB, Curricula Design, Employability

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1 WHAT IS IT?

The Shadbolt Review [18], 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 higher education institution (HEI). The discipline was already acting proactively to address the issue. Related professional bodies have enhanced their accreditation processes in response 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 [18, 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 [10], 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 [12]. Equally, its value has been highlighted particularly in the context of a potentially globally mobile workforce [12]. 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 UK, the most common form of accreditation for computer science and cognate disciplines is through two professional bodies: BCS, The Chartered Institute for IT (BCS) and the Institution of Engineering and Technology (IET). The accreditation provided by these bodies are underpinned by international initiatives such as the Washington Accord [1, for CEng] and Seoul Accord [17, for CITP]. These memoranda support the internationalising of the curriculum and promote consistency and parity in computer science education globally. The BCS and IET broadly check two things [2, 11]:

(1) *Are the exit standards of the programme appropriate for the level of accreditation sought? 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 this 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).*

3.1 The value of accreditation

What is the value of an accredited degree? Like all forms of accreditation/endorsement, it provides a recognised kite-mark that can assist marketing and promotion of programmes. Whilst a standards-based approach is followed, an enhancement-focused approach is increasingly taken; in addition, the BCS is continuing a conversation to explore the value proposition of accreditation from the point of view of other stakeholders. The following are aspects of the value to accredited HEIs.

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

Promoting internationally-recognised standards The BCS accredits to internationally-recognised standards, which evidence the global parity of the degree programmes accredited. Part of the value here is linked to the value of professional registration; this assists in the global mobility for the graduates of accredited programmes. BCS currently has a project investigating how to enhance the value of professional registration to students, graduates and early career professionals.

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 promote curricula discussions (for example, with introductory programming [13]) and change. The most recent example of this is the inclusion of cybersecurity in all accredited degrees [7]. BCS mandates the inclusion of security in all accredited degree programmes to a standard agreed between professional bodies, industry and government. BCS had been requiring coverage since 2015 [2, p. 17–18] with the result that all accredited universities must be compliant by 2020 (due to the five-year cycle of accreditation) [7]. Furthermore, group working experience is mandated by BCS (criterion 2.3.1 [2, p31]). This is extremely valued by employers, but typically disliked by students at the time, and features negatively in many student surveys. It is likely that if many UK universities, which are heavily judged by current student opinion, were left to themselves without accreditation, they would probably remove group working.

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.

Industry relevance All BCS accreditation panels include an industrial assessor, in part to ensure that currency and relevancy of programmes, to develop graduates who are able to enter a competitive employment market. Evidence that a visited HEI's mechanisms for engaging with industry are supporting graduates so as to achieve 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.

Accrediting work experience BCS has introduced accreditation to Professional Registration for IT Technicians (RITTech) as a mechanism for accrediting industrial experience (or work-based learning) gained during a placement, foundation degree or work-experience as part of a degree apprenticeship [2, p8]. This development was introduced in response to the Shadbolt Review.

3.2 Driving improvement

The Shadbolt Review has led to a number of enhancements, with a variety of sources of data being employed to help drive the improvement efforts. For example, the 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.

3.3 Reducing bureaucracy

Continuous review of BCS Accreditation practice has been taking place since 2015 with the intention of adopting an enhancement-focused 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 an HEI prospective has resulted in the following changes:

HEIs 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 has understandably been mixed, partly due to travel and funding. Since 201, all briefings have taken place by video conference; feedback on this approach has been positive.

The application itself From a paper+digital submission before 2015, BCS has now moved to a fully digital submission. BCS is flexible in how the information is submitted, including the use of institutional virtual learning environments. 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.

Areas for discussion at visits It is now normal practice for a BCS panel to communicate likely areas of discussion to the HEI prior to 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, supportive and constructive.

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 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%

Recent work indicates that accreditation has driven cybersecurity education in the UK [7] – as opposed to the US, where is it also in the recommended curricula – but the corresponding accreditation requirements are much more recent.

5 WHO ELSE HAS DONE THIS?

In the UK, in addition to the IET and BCS providing accreditation, a number of other agencies provide endorsement for computing and technology-related areas; these schemes are commonly intended to promote employability of graduates. This bodies include Tech Partnership Degrees [9]; TIGA, a trade association representing the UK's games industry; and Screenskills (formerly Creative Skillset) [16]; The Chartered Society of Forensic Sciences [15]; and the National Cyber Security Centre [14]. At present, little evaluation has been conducted regarding the effectiveness or otherwise of these endorsements, especially in a post-Shadbolt era.

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 [8]. A micro-credentialing approach is being developed as part of 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 national or international standard (in the way there is for the Seoul and Washington Accords) for micro-credentialing. This approach is also looking at work experience with the aspiration to accredit student competences in work related skills. The BCS is actively working with IoC to further explore micro-credentialing and accreditation.

The wider academic computer science community has also responded actively to the challenges presented by Shadbolt, with CPHC developing four working groups [6]. Finally, the Royal Academy of Engineering Visiting Industrial Professor Scheme[1] is an example of how national academies and professional bodies are promoted sustained 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 of BCS professional membership to students, graduates and early career professionals. There are also interesting developments being led by the IoC related to micro-credentialing. The BCS is currently in the process of refining its processes for the promotion of good practice, and will continue to consider opportunities for the further involvement of employers in accreditation. 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 UK higher education terms without indicating that local equivalents are equally acceptable; the next set of accreditation guidelines will address this disparity.

The approach adopted in the British jurisdiction of the Washington Accord is unusual: the Engineering Council currently extends the license to accredit *Chartered Engineer* (CEng) to 35 professional

[1] https://www.raeng.org.uk/grants-and-prizes/grants/schemes-for-people-in-industry/visiting-professors-in-innovation

bodies[2]. This is not the practice adopted in other jurisdictions; for example, in the USA, the Accreditation Board for Engineering and Technology (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 CEng accreditation [5], with further changes 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. Among other proposals, AHEP 4 intends to extend CEng accreditation to include diversity and widening participation data (of staff and students) as part of the metrics that assess the quality of provision; this is clearly a significant issue in the UK, and will likely require a long-term commitment from HEIs and other bodies to address.

There are considerable external quality assurance pressures placed upon HEIs in the UK; for example the Research Excellence Framework (REF) and the Teaching Excellence Framework (TEF); indirectly, both of these could impact upon the priority placed upon accreditation as a mechanism for supporting enhancement. BCS continues to review the bespoke documentation it requires and to make improvements where 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.

The BCS continually reviews and monitors the support process it provides for HEIs seeking accreditation, with the aim of evaluating and enhancing processes in this area. There is a strong and vibrant community of academics and industrialists who actively participate in accreditation. However, communication and dissemination of best practice is an issue; for example, for HEIs how best 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 also indicated that more regular communication with assessors would be beneficial, including assessor professional development sessions and building a community of practice.

7 WHY ARE YOU TELLING US THIS?

The main themes in this paper are further contextualised by a wider focus on digital skills and computer science education reform, especially across the nations of the UK [4, 19]. As part of this, there is a focus on bridging between the education and skills demands of academia and industry, as we have seen with national initiatives such as the Institute of Coding. One of the key recommendations of the Shadbolt Review is that the value of accreditation should be more clearly communicated to stakeholders; this paper is part of a set of initiatives to address this recommendation. Much has changed in BCS accreditation in the last few years; for many academics, their only experience of BCS accreditation would be via their quinquennial accreditation visit. Accreditation by the BCS is performed by panels of BCS assessors, and an assessor may be an industrialist or an academic. While the size of a panel varies depending upon the number of programmes a visited HEI is putting forward for consideration, a panel will always include an industrial assessor and two or more academic assessors. But not all HEIs have academic assessors on their faculty; 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 – in professional body accreditation, and the opportunities to engage in shaping the wider research and policy agenda in this important area.

[2]https://www.engc.org.uk/about-us/our-partners/professional-engineering-institutions

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