
AC 2011-318: CIVIL ENGINEERING IN A TIME OF CHANGE: THE RESPONSE OF THE INSTITUTION OF CIVIL ENGINEERS LIBRARY

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Mike Chrimes was born on 25 June 1954 in Neston, Wirral, Cheshire (about 10 miles from Liverpool and Chester) where his family have lived since the early eighteenth century. After attending Wirral Grammar School he studied Modern History at University College, London. He then began a career in Librarianship with Liverpool City Libraries. He became interested in developments in Information Technology in Librarianship and attended a post-graduate course at Loughborough University of Technology.

In July 1977 Mike joined the staff of the Institution of Civil Engineers as Audio-Visual Librarian. In 1978, following the retirement of H C Richardson, the Librarian, Mike became Deputy Librarian and for the best part of a decade worked with Doreen Bayley, the Librarian, in improving services, notably retrospectively converting the Library Catalogues to one online catalogue (the first unified catalogue since 1895). This project was continued after Doreen's retirement in 1987 with a single computerised index of all ICE publications, and the digitisation of all ICE journals the first engineering institution in the world to carry out such a project. When the ICE building was refurbished c.1990 he planned the Library accommodation.

Early in his career at ICE Mike became frustrated by the paucity of historical information about civil engineering. He felt it hampered instant access to the collections. He began to lecture and write on the subject, publishing pieces in the Institution's weekly magazine 'New Civil Engineer', and then 'History of Technology', the Newcomen Society 'Transactions', 'Geotechnique' and the ICE 'Proceedings'. He has acted as Secretary to the ICE Archives Panel Biographical Dictionary of Civil Engineers Project, writing a large number of articles. The first volume appeared in 2002, and the second will appear in 2007. He has written and lectured extensively on the history of civil engineering. The author of 'Civil Engineering 1839-1889: A Photographic History', he has edited four other books including 'The Civil Engineering of Railways and Canals' and 'Historic Concrete'. He is currently writing a paper on the development of geotechnical engineering prior to 1940. In October 2003 he contributed three chapters to 'Robert Stephenson: The Eminent Engineer', edited by Michael R Bailey (Ashgate, 2003). He has an interest in the economic aspects of the growth of civil engineering since mediaeval times, and is keen to promote an awareness in the contribution of civil engineers to economic growth among the general public.

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Civil engineering in a time of change: the response of the Institution of Civil Engineers Library

Abstract

Rapid changes over the past decade in the UK public and academic library landscapes have been reflected in changes in special and learned society libraries. While the former sectors been widely researched and reported on in the UK, the same is not true of the special engineering sector. In a period characterised by the disappearance of traditional libraries and their partial replacement by knowledge management systems and a naïve belief in the power of Google, engineering societies have considered alternative responses to the emerging library world. With specific reference to the Institution of Civil Engineers (ICE), the UK's oldest engineering library, the sustainability of these approaches is considered. While some UK membership bodies have turned exclusively to electronic content to support professional qualification, others continued with more traditional media. The Institution of Civil Engineers pioneered the retrospective cataloguing of its collections, and the indexing of all its publications. This was followed by the digitisation of all its *Proceedings* long ahead of, for example, the Royal Society of London. At the same time collecting the archives of engineering firms has enabled the growth of its historic collections at a time when many companies have discarded their heritage.

Introduction

Historical background

The Institution of Civil Engineers' (ICE) Library, established in 1819, was the first engineering Library in Britain. ICE, established in 1818, was the first professional engineering body in the world¹. These dates of foundation are more or less contemporary with the establishment of early technical universities and associated libraries in continental Europe, reflecting a British response to a western world development – satisfying the societal need for trained professional engineers. It was also approximately 30 years prior to any national technical library collection.

When the ICE Library was established there was only a limited published engineering literature, and the initial focus was on the acquisition of engineering drawings². In 1836 ICE began publishing its *Transactions*; *Minutes of Proceedings* followed in 1837. This again was contemporaneous with the development of engineering journals across Europe and the USA, and enabled the Library to grow through exchange and purchase³. The collection was international in its scope, and comprehensive in its aims. In 1900 it was the largest specialist technical collection in the UK, of similar size to the Patent Office collection and perhaps only exceeded internationally by the Ecole des Ponts et Chaussées in France and the Institute of Railway Engineers collection in St Petersburg, Russia. All three were State funded bodies. ICE was, and remains, funded through members' subscriptions and donations. It should also be noted that since the 1870s ICE had been publishing abstracts of foreign and technical journals in its *Minutes of Proceedings*.

In the twentieth century a number of factors combined to change the ICE's primacy. The rise of more specialist engineering societies, modelled on ICE, with their own libraries, and an increasing focus of civil engineering on engineering of the infrastructure / construction, led to a more restricted collections policy, relying on other engineering bodies for other disciplines.

Beyond that the work of Bradford at the Science Museum before the Second World War, and Urquhart's establishment of the Lending Library Unit (now BLDSC) afterwards, meant that there was a national fall back. The Department for Scientific and Industrial Research reform of national library provision in the late 1960s⁴ meant there was a clear rationale in collecting policies for science and technology. This was a complete change from the position in 1819.

Financial pressures also had influence, leading to the abandonment, except in niche areas, of *Engineering abstracts* after the First World War. Of course, the IET (then Institution of Electrical Engineers) continued to invest in Science Abstracts, an investment which has proved sound. For ICE there was not only that competition, but also Engineering Index, and the abstracting services of the various UK government research laboratories – Building Research (BRE), Road Research (now TRL), Water Pollution Research (Now WRc). The latter bodies had considerably more resources than ICE. A little later the Ministry of Public Buildings and Works, later the Property Services Agency (PSA), introduced *Construction References*. All of the above services developed online versions – *INSPEC*, *BRIX*, *IRRD*, *Aqualine*. BRE and PSA later briefly contributed to *ICONDA*. ICE briefly entered the fray again with *ICE Abstracts* in the 1970s. The competition remained stiff and poor financial returns led to its sale. It survives as *International civil engineering abstracts* published by Emerald.

The Library also came under internal pressure within ICE. As other functions expanded its space was challenged. The changing subject focus in its collections helped with discardments, but did not resolve this issue. However, the Library's central role in providing information to practicing engineers remained constant. No British company or academic institution has been able to attempt the broad range of coverage – technical, chronological or geographical.

There were important service developments in the first half of the twentieth century – the introduction of postal loan services – vital for a body with membership across the UK, and also an audio-visual loan collection to support teaching. Most of the collection was reorganised in the 1950s and classified using UDC. However, the initial response to computerisation was slow – both in terms of the Library catalogues and access to 'online' databases. Committees met, reports were received, but not money was available.

These IT issues were resolved in the mid-1980s and incorporated in the Institution's Corporate Plan. As a result additional staff were employed to complete a retrospective computer conversion of 13 Library's catalogues. This developed almost seamlessly into a conversion of all the indices to ICE publications, and then the digitisation of all ICE journals from 1836. This project was subsumed in the ICE Virtual Library noted below. Within a decade, from lagging behind developments elsewhere, the ICE Library led catalogue digitisation. There were striking increases in the ability of staff to handle enquiries previously suppressed by a limited number of phones. Some idea of changes can be derived from Table 1. In 2009 ICE were supplying 1000 scans a month for the first time

TABLE 1

	1938	1983	1990	2000	2006	2010
Visitors	2594	7000	6500	6300	6267	5317
Postal enquiries	2435	317	360	700	542	235
Phone enquiries	937	9805	14500	24000	18841	12607
E-mail enquiries				6000	23998	29200

Of course, current IT investment is constrained by financial circumstances, but it is perhaps worthwhile reflecting also on the developments elsewhere in the UK and its civil engineering information sector.

General developments in civil engineering in the UK 1980-2010

As already intimated professional engineers in Britain could call on a number of information sources in the late 1970s – professional engineering institution libraries, government research stations, the national library network, their own company libraries. There were also a number of trade bodies, notably the Cement and Concrete Association, providing largely free information. Since that time most of these resources have been privatised or disappeared – PSA has gone, BRE no longer provides a database, TRL’s role is much changed.

In addition many long established consulting engineering practices have merged or disappeared, as have UK contractors with their own research capabilities. At the top there has been increasing international ownership and consolidation (see tables 2 and 3). The move from microfiche-based technical information to web-based tools has encouraged many companies to dispense with physical libraries and associated information officers. Companies like Coode and Partners had largely intact job archives dating back to the 1850s in the 1980s⁵ which have been dispersed as new owners (WSP) questioned the value of storage.

The result of this process has been to give a renewed significance to the ICE. It is more than ever the corporate memory of the profession, as suggested in the tables below.

TABLE 2 – top firms, *New Civil Engineer Consultants’ File* (1980)

Company	Staff	ICE Archives	Now
Arup	2,000+		Arup
Atkins	2,000+		Atkins
Gibb	1,350	D, C	Jacobs
Halcrow	1,250	C*	Halcrow
Scott Wilson	1,150	C*	URS
Binnie	1,100	C, P*	Black and Vetch
Murdoch Macdonald	1,000	C	Mott Macdonald
Merz and McLellan	1,000		Parsons Brinckerhoff
Mott Hay Anderson	1,900	C, P	Mott Macdonald
Kennedy and Donkin	900		Parsons Brinckerhoff
Maunsell	900	D, C, P	AECOM
Rendel Palmer and Tritton	900	D, C, P	HPR
Freeman Fox	700	D, C, P	Hyder
Preece Cardew	700		Mott Macdonald
Watston Hawksley	650	C*	MWH

TABLE 3 – top firms, *New Civil Engineers Consultants’ File* (2010)

Company	Staff	ICE Archives	Now
Mouchel	6,850	D	Interserve?

Atkins	6,800		
Jacobs	6,450	D, C	
Parsons Brinckerhoff	6,000		Balfour Beatty
WSP	6,000	D, C, P	
Halcrow	5,500	C*	
Mott Macdonald	5,500	D, C, P	
Arup	4,800		
Scott Wilson	4,800	C*	URS
RPS	3,200		
AECOM	2,500	D, C, P	
ERM	2,500		
Amey	2,200	D, C, P	(formerly Owen Williams)
Mace	2,200		
MWH	1,900	C*	

KEY: * personal, not company, donation; D (drawings) ;C (calculations and reports);
P (photography)

Anybody working in the 1970s, familiar with the way recent ICE acquisitions were used and cared for then, would have witnessed a breakdown in corporate care for the industry's information heritage and an understanding of its commercial value. The recent ICE State of the Nation report on the UK National Infrastructure highlighted a problem in finding water industry records. Work by Heisig and others also noted that engineers value information on as-built data, and records of design changes and decisions.^{6 7} By collecting such material ICE is answering a need.

Before this process of consolidation and take over took place the ICE had already established an Archives Panel. They developed an Archives Policy based on representative acquisition of archives. Acquisition concentrated initially on the nineteenth century. Deaths over the last 20 years, and the consolidation process already outlined have meant that the archive has now become a major repository of civil engineering documentation for the twentieth century. The Library itself has been in monthly receipt of physical libraries from companies extending over tens of metres. This had led to a radical revision of space management!

There has been some indication of impact in the academic world, where central purchasing of e-resources has been combined with the disappearance of subject libraries and specialist staff. At Imperial College London, ICE now provide the civil engineering department with its library catalogue, the College Librarian having refused to support a departmental collection:

The impact of the web and related IT developments

This process has, of course, taken place against the background of the development of knowledge management systems, the use of the internet generally to retrieve information, the loss in primacy of bibliographic databases, the perceived irrelevance of library catalogues and the potential for radical changes in user behaviour.

These developments in the UK have been monitored by a series of reports notably those funded by RIN (Research Information Network), and JISC (Joint Information Systems Committee). Although focussing on the academic environment, they are effectively

discussing how the future generations of professional engineers are learning to use information, and what their likely expectations are when they get into the workplace.

The 2010 JISC report: *The digital information seeker* consolidates many findings which tell a similar tale⁸ :

- a preference for e-access rather than visits to physical library which is regarded as a collection of books
- the general population is using libraries and electronic resources of all kinds less often
- frustration in inability to access e-journals through one portal / gateway
- the use of general search engines in preference to bespoke gateways
- development of individual (not necessarily well-informed strategies) to avoid information overload
- desire for 'direct' (desktop) access to all kinds of digital materials
- young people may have confidence in their ability with computer, but lack information literacy
- there is an awareness of the pitfalls of the internet, but not necessarily the education to deal with such issues
- speed and convenience are important to users
- age and gender have been influential on e-book take up (Kindle sales suggest a new consumer model is about to develop)
- e-journals are now a critical part of the academic research environment, and have been a sound investment
- the need for librarians to change their behaviour and reassess how they provide services, market them, and educate users
- users expect discovery – to deliver content
- enhanced catalogue content – the Google / Amazon site experience
- advanced search options developed by libraries are little understood and thus used by users
- users expect a unified web experience from developments in IT, digital offerings and their institutional investments

Issues regarding information skills can hardly be overstated. The RIN report: *Minding the skills gap* does not make comfortable reading for the library profession, who may have the skills, but have failed to demonstrate relevance never mind leadership⁹. No more did their predecessor report¹⁰.

The library profession has not always taken advantage of technology. The potential of RFID for public libraries has been competently demonstrated by Martin Palmer in Essex¹¹, but the CILIP 2010 Conference demonstrates there is a long way to go¹².

We are working in an environment where libraries are either under attack – some local authorities in the UK are contemplating cutting 50% of their branches – or considering how to manage in a very difficult world. Academic libraries have expanded with the sector, investment in e-journals has been validated by user take-up. They now face a different financial world, and one where users rarely think 'library'. A clever balancing act between staff, resources, collaboration, and teaching vis-à-vis research support is being crafted¹³. At Stony Stratford public library near Milton Keynes users borrowed all the available books in January 2010 to pre-empt closure.

The lessons for ICE Library

For ICE the lessons from recent research are just as relevant:

- seamless access
- exploit all formats
- initiate successful web services
- advertise the brand
- promote the value of quality information and information finders
- align with users

There are opportunities for us. There is a belief that SMEs (enterprises with under 250 employees) find it difficult to access scholarly publications. A University College London study for RIN is investigating this at present. It is felt to be a brake on research dissemination and innovation¹⁴. ICE are collaborating with this research. The ICE Library are in a position to help as they offer online access to e-material; have a team of trained professionals to help in discovery, and the ICE Virtual Library is available to thousands of civil engineers in SMEs.

There are also issues when working in a sector that has frequently been regarded as information-shy – often because of the metrics used. Take-up among ICE members of online communities has been patchy over three web iterations in the last ten years. This is not a practitioner issue. The RIN report: *If you build it, will they come? How researchers perceive and use web 2.0* revealed within engineering only 1.82% of engineers were frequent bloggers compared to 7.74% in computer science¹⁵. That may give us breathing space to build on the experience of others. While the same report supported traditional and e-journals as the primary routes for dissemination, there is considerable expectation that use of open access publishing and collaborative working will increase.

Learned societies have met these recent challenges in different ways. In broad terms it is a resource issue. The library units that make up the Engineering Institutions Librarians' Committee (EILC) and the London Learned Societies and Professionals Group (LLSPG) vary from sole operators to employing more than a dozen staff. Some bodies, like the IET and Royal Society of Chemistry are well funded, others less so. Collectively, these bodies have tried to negotiate with major publishers on both e-journals and e-books. Publishers are used to dealing with academic consortia, established authentication methods, and a uniform user base. Learned Societies tick none of these boxes. The librarians have learned off each other, had some success, with some publishers, in persuading them that thousands of members worldwide does not mean thousands of simultaneous users, or that the academic members will abuse deals between their societies and publishers to cut their academic subscriptions.

The two forums are useful in learning from best developing practice. The Royal Institution of Chartered Surveyors (RICS) have abandoned book loans – all the societies have seen a drop-off here. The Royal Society of Chemistry have gone all electronic in terms of their serials. IET and the Institution of Mechanical Engineers have had success in promoting the KNovel e-book range – less attractive to ICE because of its relatively low civil engineering content. The CIPD (Chartered Institute for Personnel Development) and RCN (Royal College of Nursing) have been very successful in developing web packages to support professional development.

ICE are now developing an online competency framework tool to enable personal assessment, with the possibility of links to resources to fill 'gaps'. At ICE, as are other engineering institutions, we are currently experimenting with the EBSCO Discovery platform to try and resolve issues of access to various publications, e-journals and e-books offerings. However, new developments are difficult in the current economic climate.

From discussions with company librarians, and experience with e-mails and web broadcasting, it is evident many workplaces have firewalls that make direct e-communications with ICE content difficult from members workplace desktops. We are thus unable to become the source of first choice, coming after workplace resources in the search for information. New users come to us because of the failings of their normal sources, or because they see us as a repository of what they regard as historical material. By providing a timely service – all enquiries get a response within a working day, and good customer service we try and get repeat visits. Satisfaction rates are over 90%, and bring up the overall member satisfaction rate with ICE. Promotion takes place through regular adverts in *New Civil Engineer*, which is received by most active members, a section in the fortnightly e-newsletters, and frequently addressing meetings. In 2010 the Library was given 'designated status' by the Museums, Libraries and Archives Council (MLA) in recognition of the (inter)national significance of its collections.

ICE Virtual Library

One area where ICE led other professional bodies was in its development of the Virtual Library (VL) (<http://www.icevirtuallibrary.com/>). In its first gestation the ICEVL was a collection of PDFs of 36,000 ICE journal papers. Over the past decade additional content and functionality have been added reflecting advances in web technology and electronic publishing. Some of these would raise eyebrows if they were not present – pre-publication of papers, online discussion, RSS feeds, email alerts – but others have been developed to take account of librarians' feedback. Some are more directly associated with the learned society / professional engineering association. The ICE is predominantly a body of practising engineers. Despite the drive of academics to publish, there is still a desire to capture and provide content of value to practitioners. For a general practitioner an online subscription to a specialist research journal – virtual or physical – is unlikely to have much appeal. On the other hand the facility to have access to a package of content that can satisfy both CPD and changing project requirements is a different matter. So members can subscribe to journals, and they can access and share a selection of material. To the journals has been recently added all ICE conference papers. There are also a range of manuals and textbooks, as well as historical gems like *The Life of Thomas Telford* (1838) to satisfy a range of professional interests. In December 2010 there were visits from 169 countries. (Figure 1)

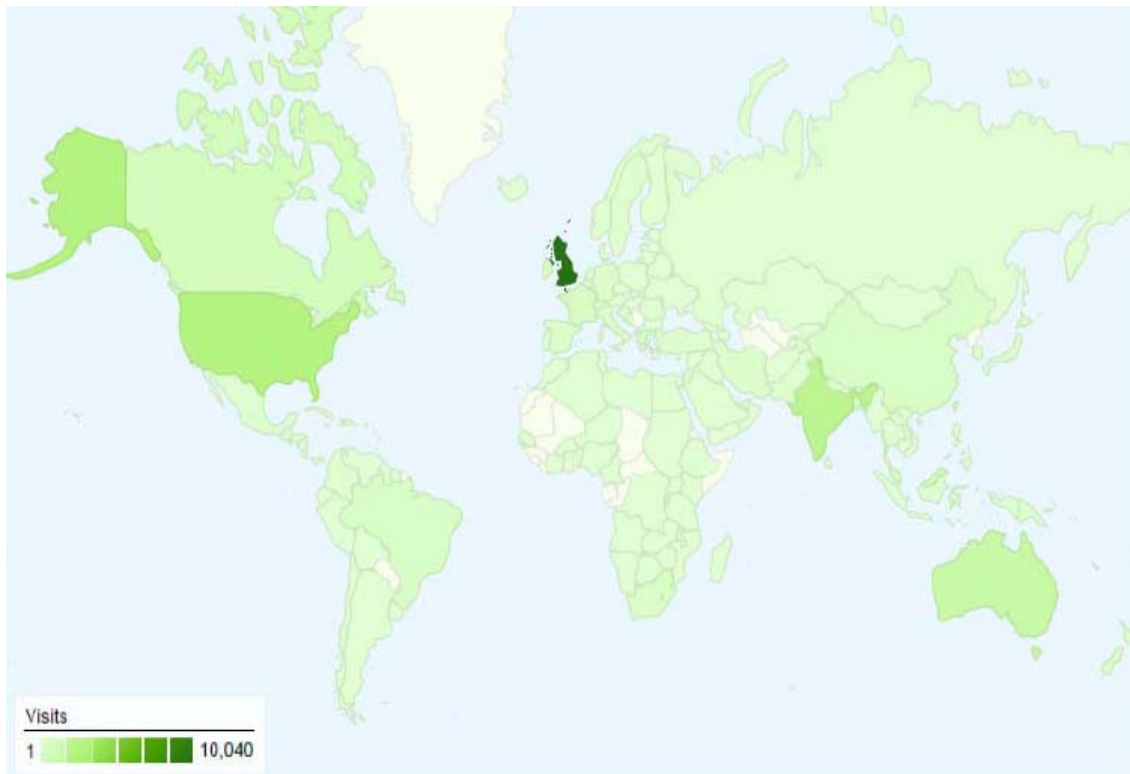
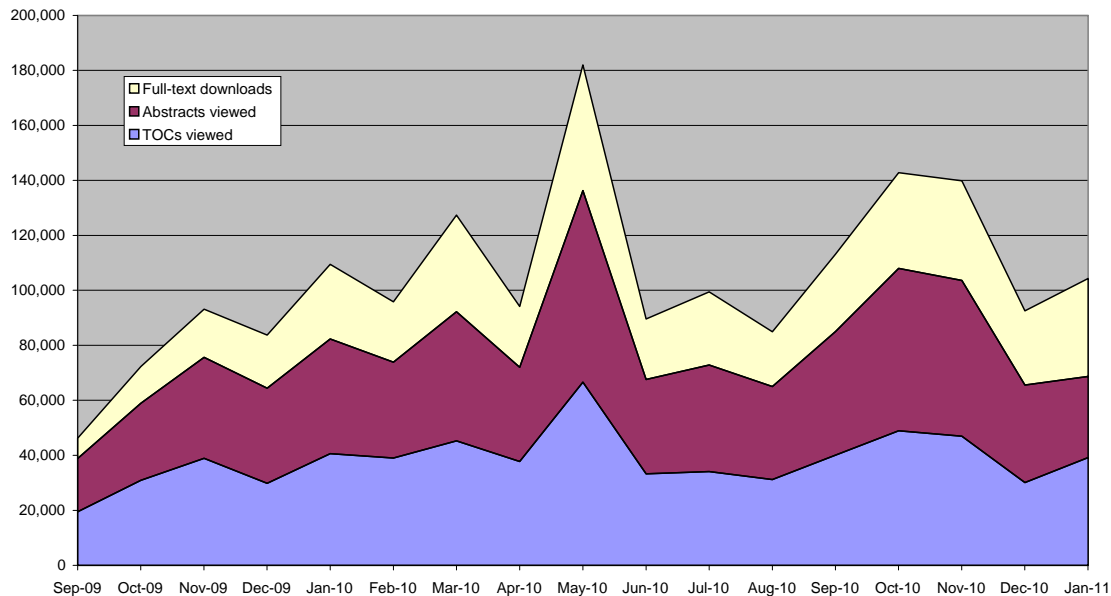


Figure 1 Global use of the ICE Virtual Library December 2010.

Growth in use has been striking, and is now measured in tens of thousands (Figure 2). In 2011 we are looking at enabling mash-ups from 3rd party content and more archival content. Keeping visitors in when there is a 50% drop off from Google entrants is a challenge. ICE are constantly striving to make discovery easier, and the ability to interact with content and comment on it.

The VL's publishing mix of undergraduate textbooks, a recent development based on student feedback, with a range of research and practitioner material, seems to fit in with what a (UK) Publishers Association Conference (2010) reported more generally¹⁶.

Figure 2: ICE VL book and journal usage



Learned Society events

Just as the internet has changed the face of publishing and tools for delivery of traditional print journals, it has impacted UK Engineering Society activity, traditionally based around physical attendance at meetings. It has been possible for some time to offer access to live and recorded lectures online. The IET has led the way in recording events and publishing them through its website <http://tv.theiet.org/> IET.tv now hosts over 3000 lectures dating back nearly 10 years.

The ICE website itself has technical issues with streaming and has been using YouTube to make footage available: <http://www.youtube.com/user/civilengineeringtv>. ICE has also been recording presentations using AT&T and Adobe technology, and the online audiences in January 2011 for the first time have exceeded physical attendees. Improved digital communications facilities in the Headquarters building should accelerate this trend.

Conclusions

The problem for the 'Library' itself is maintaining its identity. The Library team may create content, but be virtually invisible. Digital success is anonymous. When answers to enquiries are provided through the web portal 'Ask Brunel' service, some users seem to believe it is the ghost of Brunel answering rather than the modern information professional.

The first choice of engineers in search of information for generations has been their neighbour at the drawing board. In the web 2.0 world such neighbours can be physically more remote. For a Learned Society such as ICE it is the quality of information that has retained relevance through more than 200 years. If not first port of call ICE can at least be a friendly and reliable source.

Moreover there is abundant evidence that ICE Library's blend of unrivalled historical resources, international coverage, and subject range will remain relevant through the twenty-first century. Central government shows little willingness to guarantee library funding, and professional bodies have an obligation to society to provide relevant information. If not rosy, the landscape is interesting and with challenges that can be overcome.

¹ Ferguson, H. and Chrimes, M.M. *The Civil engineers: a history of ICE*. London: ICE, 2011.

² Chrimes, M. M. *The ICE Library and Archives: a brief introduction*. *Construction history*, vol.5, 1989, pp.59-65. Later revised for CHS newsletter, 2003.

³ Chrimes, M. M. *Catalogue of periodical publications 1665-1994 (introduction)*, London: ICE, 1995

⁴ F.S. Dainton (Chair). *Report of the National Libraries Committee*. London: HMSO, 1967

⁵ Chrimes, M. M. *Civil engineering 1839-1889: a photographic history*. Stroud: Alan Sutton, 1991.

⁶ Heisig, P. and others. Exploring knowledge and information needs in engineering from the past for the future – results from a survey. *Design studies*, **31**, 2010, 499-533

⁷ Institution of Civil Engineers. *State of the nation: infrastructure*. London: ICE, 2010

⁸ JISC: *The digital information seeker: findings from selected OCLC, RIN, and JISC user behaviour projects*. London: JISC, 2010.

(<http://www.jisc.ac.uk/publications/reports/2010/digitalinformationseekers.aspx#downloads>)

⁹ RIN. *Minding the skills gap: information handling for researchers*. London: RIN, 2008.

¹⁰ RIN . *Researchers' use of academic libraries and their services*. London: RIN, 2007)

¹¹ Palmer, M. *Making the most of RFID in libraries*. London: Facet, 2009,

¹² *Library and Information Gazette*, 21 October 2010, p.1-2

¹³ RIN. *Challenges for academic libraries in difficult economic times: a guide*. London: RIN, 2010.

¹⁴ CIBER. *Access to scholarly content: gaps and barriers: an interim report* . London : UCL, CIBER, 2010.

¹⁵ RIN. *If you build it, will they come? How researchers perceive and use web 2.0*. London: RIN, 2009.

¹⁶ *Library and Information Update*, December 2010, p.8