

Designing Buildings Wiki The construction industry knowledge base 21 September 2017

# Fit for purpose?

# Big data reveals the construction knowledge gap.





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## Summary

#### Who we are

Designing Buildings Wiki is the construction industry knowledge base. Launched in 2012, it provides a free, cross-discipline platform for publishing and finding articles about the planning, design, construction, operation and disposal of built assets.

Accessed by more than 3.5 million people a year, Designing Buildings Wiki has more users than any other construction industry website. It is an ever-growing resource that now includes more than 5,000 articles.

Designing Buildings Wiki is supported by: Institution of Civil Engineers, BRE Trust, Chartered Institute of Building, U and I Group PLC, BSRIA, Institute of Historic Building Conservation, Chartered Institute of Architectural Technologists and Rogers Stirk Harbour + Partners.

#### What we did

This report considers whether the knowledge framework that underpins the performance of the construction industry continues to meet the needs of its users. Given the recent Grenfell Tower fire, the Edinburgh schools defects and the continuing performance gap, this is a timely study that analyses the knowledge practitioners require in their daily working lives to ensure standards are maintained.

We looked at how practitioners from every part of the industry create and access knowledge. We cross-referenced our 5,000 articles with 6 million data points, scrutinising a range of factors including; connections between subjects, the popularity for subjects, the number and duration of views, and the age, sex and location of readers.

Our findings have generated a series of never-before seen maps of construction industry knowledge, allowing us to draw some surprising conclusions about what knowledge is available, what knowledge people want and what needs to change. This report asks a crucial question - is construction industry knowledge fit for purpose?

#### What we found

- The industry is lacking the strategic leadership necessary to coordinate the preparation of knowledge, ensuring appropriate funding is available, filling gaps and avoiding duplication of effort.
- There are significant differences between what the industry publishes and what practitioners need. Practitioners need more practical, easy-to-use guidance to help them carry out everyday activities.
- Knowledge that is buried in long documents or locked behind pay walls will not be used even if it is critically important.
- Differences in the way users access knowledge creates opportunities to target information, for example, to encourage women to stay in the industry or to encourage participation in the regions.
- BIM remains a specialist subject, disconnected from other industry knowledge.

# Background

#### The construction industry is changing

The construction industry is subject to increasingly strict performance requirements, it has developed a more complex, fragmented supply chain, and it is adopting digital tools in every part of the project lifecycle. It is also operating in a context of lifelong learning and globalisation, again with the adoption of new, disruptive digital tools throughout. It is crucial that we continually assess the structure of the industry to verify that it properly serves these changing needs.

#### The knowledge framework

The industry is supported by a framework of legislation, regulations, case law, standards, contracts, professional practice and research that establish the boundaries for acceptable performance. Without this framework, it would be difficult for practitioners to have a clear understanding of the standards that are expected of them and what they need to know to perform particular tasks.

It is vital that this knowledge framework responds to the changing context if it is to be fit for purpose. Incidents such as the Edinburgh schools defects and the Grenfell Tower fire show this is not just a matter of maintaining performance; people's lives depend on it.

A wide range of organisations support the creation of knowledge that underpins the industry:

- Government (government departments, Innovate UK and so on).
- Research councils.
- Higher Education Funding Councils and higher education institutes.
- Business enterprise (such as manufacturers, contractors and consultants).
- Private, non-profit organisations (such as institutes and charitable trusts).
- Oversees organisations (such as the European Union).

In very general terms, these organisations follow a traditional model for funding knowledge creation. Broad strategic subject areas are identified by high-level assessment of what the future challenges are likely to be, then funding programmes are established to support the creation of specific pieces of knowledge within those areas. There are exceptions to this top-down model, for example, private sector research and innovation, and the development of publicly available specifications (PAS) which tend to be more bottom-up, demand-driven.

Knowledge dissemination also tends to follow the traditional route of publishing research papers, policy documents, best practice guidance, standards and so on. Increasingly, these publications are digital rather than in print, but they often follow a 'closed' rather than 'open' publishing model, charged for, or behind some form of sign-up barrier, and in some cases they are not published at all.



#### The impact of the Internet



So the creation and dissemination of knowledge is controlled by a relatively small number of publishers who decide what is made available and how it is accessed. But the emergence of the Internet is tearing this model apart.

The first website was published in 1991, the billionth website was published in 2014. The bottleneck created by publishers has been removed, giving knowledge consumers and knowledge producers direct access to one another. And even more striking is the fact that the distinction between knowledge consumers and knowledge producers itself is disappearing.

#### Now, everyone can be a publisher.

People act based on the knowledge that is most easily available to them. But in a world where everyone is a publisher, this may not be the right knowledge. There is an expectation that everything is available, and that questions can be answered immediately. If expert knowledge is not available, or if it is long-winded or difficult to access, people will use something else - whether it is right or not.

It is vital therefore that the organisations creating the knowledge that underpins the construction industry ensure critical information is available, people can find it, and it is in a format that is easy for them to use. To do this effectively, the industry needs to know:

- What knowledge is needed.
- What knowledge is available now.
- Where the gaps are.
- Who is best placed to fill those gaps.
- How to disseminate knowledge that is created.
- How it will be kept up to date.

However, at the moment, there is little industry oversight or discussion of these issues. This is surprising, because they are not academic questions. In an increasingly complex industry, if there is no clear understanding of the knowledge framework that defines and supports the standard of performance expected, mistakes will be made.

In this report, we ask whether construction industry knowledge is fit for purpose.

### What we have done



Designing Buildings Wiki is the cross-discipline knowledge base for the construction industry, allowing people from every part of the industry to share and find knowledge free of charge.

Every year, more than 3.5 million people use Designing Buildings Wiki to access more than 5,000 articles about the planning, design, construction, operation and disposal of built assets. This generates an enormous amount of data about the knowledge that exists in the construction industry and how it is used. And because the articles have been written by, and read by, people from every part of the industry, that data is representative of construction knowledge as a whole.

This, combined with advances in analytical and data processing techniques, means that for the first time it is possible to ask questions about the shape of construction industry knowledge, how it is used and where it needs to improve.

Questions like:

- What knowledge is available?
- · How does this compare with the knowledge people actually need?
- How is that knowledge used?
- · What is the profile of people accessing construction industry knowledge?
- Are there differences in the behaviour of different user groups?
- · Is the knowledge framework fit for purpose?
- What needs to change?

This report is a first attempt to answer these questions. More work is needed, but the initial findings are important enough that they need to be shared with the industry.

# What construction industry knowledge is created

Every time one of our 5,000 articles is accessed, data is generated about the popularity of the subject areas it relates to, the links between those subjects, how long people spend reading those subjects, and the age, sex and location of the readers.

Over a representative, two month period from March to April 2017, the site was used by 724,000 people, generating 6 million pieces of data. Cross-referencing this data allowed us to build a map of construction industry knowledge, visualising knowledge cluster densities and relationships. This has revealed some clear findings about the state of construction industry knowledge and how it might be improved, as well as some wider conclusions about the state of the industry as a whole.



It is clear that there is a focus of knowledge in what might be described as 'academic' subjects, such as theory, research and case studies, as well as design and literature about products. There is less written about industry 'framework' subjects, such as policy, regulations, legislation and public procedures.

Most notably, whilst a lot has been written about Building Information Modelling (BIM), it is disconnected from other construction industry subjects. This may reflect the fact that BIM emerged as an area dominated by specialists, and has struggled to embed itself into the daily work of the rest of the industry.

# What construction industry knowledge is used



The differences between this and the previous image are striking. There appears to be less interest amongst readers in the more academic and theoretical subjects that the industry writes a lot about, such as research, case studies, history and sustainability. There is more interest in the practical and immediate day-to-day running of projects, that is; appointments, design, procurement, construction management, contracts and payment. These are the areas practitioners are likely to encounter regularly in the performance of their work, and where they are likely to need quick answers.

The popularity of these subject areas suggests there is a lack of understanding of the day-to-day activities necessary to deliver projects. Perhaps this is because of the complexity of roles in the modern construction industry, or perhaps people are being thrown into project roles for which they have inadequate training or experience and for which they are not being given effective mentoring.

Research on the other hand, is not sought out as frequently and so it may not be filtering through into practice. Whilst much research does relate to practical subjects, it is often presented in a way that is not easily accessible or digestible by people on the ground. People looking for answers to immediate problems may not have the time to find them in long, complex research papers.

It is clear then, that in very broad terms, what the industry writes about and what the industry reads about are not always the same things. This may leave practitioners to find the practical knowledge they need from other sources, beyond the key industry publishers - whether they are right or wrong.

# How long people spend reading different subjects

It is important to understand how long people spend reading industry knowledge so that it can be tailored to best suit their needs. If people are only prepared to spend a few minutes finding answers to particular questions, publishing long papers with complex answers may not be very effective.



It appears that the more popular 'project' subjects have a higher dwell time, while the more 'academic' subjects have a lower dwell time. In many cases, this is the reverse of the way information is published, in that 'project' knowledge tends to be more accessible, whereas 'academic' knowledge tends to be more detailed. The exceptions are some of the 'framework' subjects such as law and legislation, which whilst they may not be popular, are both unavoidable and complex, taking longer to understand.

#### The average dwell time across all articles is less than 3 minutes.

This suggests if readers do not find what they are looking for very quickly, they simply click 'back' on their browser and look somewhere else. Dwell time is likely to reduce even further as the time spent on mobile devices increases. A small screen is not conducive to a long read.

This means that critical knowledge needs to be made as accessible as possible, written clearly and succinctly, signposted and highlighted so it is easy to find, or there is a risk that it will be overlooked.

## Who reads construction knowledge



#### Men vs women

Whilst overall, there were fewer page views from women compared to men, this is only true from the mid-20s onward. Before that, the proportions are more equal, and if those women can be encouraged to stay in the industry, this may be a positive sign for the future.

More detailed analysis of the traffic from male and female readers reveals some significant differences in emphasis, as shown on the chart overleaf. In particular, women appear to be more interested in subjects such as 'theory' and 'case law', whilst they are less interested in subjects such as 'news' and 'BIM'.

Whilst the analysis does not reveal any gender bias in the subject areas that are written about, in that there is not a clear emphasis on 'male' or 'female' subjects, an understanding of gender interest in specific subjects could allow the the creation of targeted knowledge, for example to encourage women to remain in the industry.

Women, on average spent, 15% longer reading articles than men.

Note: The sample size becomes progressively smaller as we burrow down into greater detail, and a larger study with a greater sample size would be beneficial. In addition, gender analysis is reliant on a Google assessment of whether users are male or female.



The chart below shows the difference in the percentage of page views in different subject areas by women compared to men. The green bars indicate the subjects women access most frequently, and the red bars, the subjects men access most frequently.

#### Older vs younger

Our data confirms that younger generations are more likely to look for knowledge online than older generations. This may indicate a specific need for knowledge, particularly around the late 20's and early 30's, or may indicate a greater willingness to seek out and rely on online sources of knowledge rather than more traditional sources.

There is also a notable difference in the amount of time spent reading articles by different age groups, although it is perhaps not what might have been expected.



Whilst there is a great deal of similarity between the subjects accessed by different age groups, there are also some stark differences, as revealed by the images overleaf.

Older people appear to be progressively less interested in BIM, to the point that there is almost no interest at all from the 65+ age group, and there is also a drop in interest in education, research and innovation. There is more interest in subjects such as health and safety, regulations, and planning permission.

Note: Again, the sample size becomes progressively smaller as we burrow down into greater detail, and a larger study with a greater sample size would be beneficial. In addition, the age analysis is reliant on a Google assessment of how old users are.



# Locations of construction knowledge users

The map below shows there is a significant concentration of knowledge consumers in the main urban centres of the UK. This is as expected, but what is surprising is the extent of the focus on London. Just 13% of the UK population lives in London, but 34% of construction industry knowledge consumers are located in London.

This suggests there is 3 times as much construction industry knowledge consumption per capita in London compared to the rest of the UK.

This could be due to the concentration of many of the larger construction industry companies and university courses in London, or it could be because Londoners have a greater need for, or willingness to use online construction industry knowledge.

However, it cannot be explained by the amount of construction industry activity alone. Office for National Statistics figures suggest that just 22% of UK construction output by value is in London, well below the 34% of construction industry knowledge consumers.



# Conclusions

The age profile of online users suggests the Internet will increasingly become the dominant source of knowledge throughout the construction industry. It is vital therefore that the knowledge made available online supplies what the industry needs, in the form that it is needed. This will become even more important as Internet access moves from desktop to laptop to mobile devices, where the ability to convey information is more restricted, and dwell times are likely to be even shorter.

It is apparent that there is a strong demand for instant answers to everyday practical problems. If answers are not found quickly, in a form that is convenient for immediate use, users simply click 'back' and look elsewhere.

However, the knowledge creators in the industry still tend to focus on more 'academic' rather than 'practical' subjects, written in an academic style, where findings are buried beyond a reader's ability to find them in 3 minutes.

Even where knowledge is about practical issues, it may not be presented in a way that makes this immediately obvious, or in a form that is easy to apply. Expert knowledge is often behind a pay wall, even where it is taxpayer funded or vital for safety, it may be in a pdf format that is difficult to use, and it may include restrictions on use, such as copyright symbols, added automatically by authors and publishers with little thought about the impact this has on the usability of their publications.

This, in part, may be because of the strong tradition of funding and support programmes for specialist, niche research that is shared between experts, whereas there is relatively little funding available for broader knowledge creation and dissemination projects intended to improve general standards.

#### The industry is good at making the best better, it is less good at improving the rest.

The people best suited to writing the sort of practical guidance the industry seems to need are those who have recent experience of working on projects, but these are often the people least likely to have the time, inclination or ability to do so. Private companies also have a tendency to protect what they see as their intellectual property, keeping valuable knowledge on secure intranets that cannot be accessed by the wider industry. Incentives need to be put in place to encourage a feedback loop that allows practitioners, projects and private companies to benefit from sharing lessons learned.

Most importantly, the funding, creation and dissemination of knowledge needs to be centrally coordinated and strategically targeted to fill the emerging knowledge gap. The industry as a whole needs to take action to ensure that when people look for critical knowledge, they find it, in the right format and from the right source, so that they act based on the right information.

Actioned strategically, with coordinated industry oversight, this will also give an opportunity to better understand and serve the needs of the different user groups that make up the industry.

This report reveals for the first time that there are important lessons to be learned from the analysis of the huge amounts of data we are now able to collect about the behaviour of the industry, and that this that could significantly improve the construction industry knowledge of tomorrow, ensuring that it is genuinely fit for purpose, supporting better industry-wide performance.

# Recommendations

Six recommendations are proposed to help the industry target future knowledge creation:

- 1. More practical guidance is needed to help professionals understand how to perform everyday project activities.
- 2. Creating practical guidance will involve encouraging, supporting and rewarding contributions from practitioners with recent experience on the ground.
- 3. Research is vital to continued progress in the industry, but it needs to be presented in a way that draws out useful findings and explains how they can be applied in practical situations.
- 4. There should be a concerted effort to create targeted guidance that encourages young women to remain in the industry and promotes greater participation by the regions.
- 5. There is a need for more non-expert guidance about BIM and how it relates to wider project activities.
- 6. Most importantly of all, tackling construction industry knowledge as a whole, rather than piecemeal, demands strategic leadership to ensure that duplication of effort is avoided and gaps are plugged.

#### **Next steps**

A high-level discussion is needed, involving the current custodians of construction industry knowledge and practitioner organisations, to consider how these recommendations might be acted upon in a coordinated way.

It is vital that there is industry-wide assessment of:

- Where immediate action is required to fill critical construction knowledge gaps.
- Who is best placed to fill those gaps.
- How that knowledge should be created and disseminated in a way that best serves the needs of practitioners.
- What short-term and long-term resources are required and who will contribute to them.
- Who will provide the strategic oversight necessary to ensure construction knowledge remains fit for purpose.

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