The office: how standards define 'normal' design practices and work infrastructures

THE OFFICE

How standards define 'normal' design practices and work infrastructures

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Introduction

The post-industrial city is a complex assemblage of infrastructures. Some scholars have written about the pipes and cables buried beneath the roads and pathways of the city (Graham and Marvin, 2001), whilst others note that we only become aware of many of these infrastructures when they fail (Graham and Thrift, 2007). Here, we concern ourselves with a different manifestation of infrastructure: the office building.

In its post-industrial guise, the city in the developed economies of Western Europe and North America has come to be defined by office work ranging from finance, insurance and real estate (Sassen, 2011) to cultural industries such as advertising and architecture (Scott, 2000) along with the administration and sales work required by corporations (Scott, 1996). All these sectors and more call for offices. The office has consequently become a fundamental feature not only of cities, but of a vast range of working practices. Roughly a third of workers were found in offices in 1974, and almost half in 2005 (46%), according to the Multinational Time Use Survey (Gershuny et al., 2010).

The pipes and wires that allow flows of electricity and water into and out of the office, and the roads that bring workers from their homes, are all infrastructures that serve offices. In categorising office *buildings* as infrastructures, we follow Star and Lampland (2009), who define infrastructures in two ways. First, they define infrastructure as something 'invisible, part of the background of other kinds of work'. Second, they define infrastructures as relational. As they put it,

> one person's infrastructure is another's brick wall ... the teacher considers the blackboard as working infrastructure integral to giving a lesson. For the school architect and for the janitor, it is a variable in a spatial planning process or a target for cleaning.
> *(Star and Lampland, 2009: 17)*

In this sense, the office is clearly an infrastructure for those working within it. De Wit and colleagues (2002) describe offices as 'space[s] in which different sets of heterogeneous technologies are mobilised in support of social and economic activities', whilst Niezabitowska and Winnicka-Jaslowska (2011) adopt a similar conceptualisation, emphasising the coevolution between technologies, work practices and offices. In such views, the office is a machine for working, an infrastructural nexus of space, technology and practices (Hui, Schatzki and Shove, 2017).

In this chapter, we ask how those developing new offices and refurbishing existing ones produce building infrastructures that service a particular form of 'normal' office work. In particular, we focus on how various *standards* shape the design of office infrastructures and their impact on related infrastructures of electricity provision. By standards, we mean agreed rules which coordinate the process of designing offices and which specify acceptable levels of provision (Bowker and Star, 2000; Timmermans and Epstein, 2010). We focus on how standards define 'normal' office infrastructures that are capable of servicing 'normal' work practices. Using examples from the speculatively developed office market in London, UK, in the years 2010–2015, we show then how complex interplays between different standards generate interlocking effects that tie 'normal' offices (at least in the context of an international financial centre) to specific levels of infrastructural provision which have become ubiquitous. Underlying this trend are particular assumptions about work practices which drive understandings of what is 'needed' in a 'normal' office. This has implications for ongoing office building design and for the potential to adapt to changes in office work, office technology and environmental concern.

Offices and standards

The office is analysed in a variety of ways. For some it is an innovation junction, in which technologies facilitate work (de Wit et al., 2002). For others, it is a symbolic space, attached to the identity of the companies that occupy it (Black, 2000). It can be seen as a space defined by cultural circuits of knowledge which construct ideas about productive and desirable working environments (O'Neill and McGuirk, 2003) and organisational

forms (Burrell and Dale, 2003). Meanwhile, a political economy perspective emphasises the role of property markets (D'Arcy and Keogh, 1997) and valuation of office space in a context of financial investment in which 'form follows finance' (Willis, 1995).

We consider instead how the above influences come to be represented in a series of standards that define what the 'normal' office should provide, as an infrastructure for office work. There is an extensive literature on standards in the social sciences (e.g., Schmidt and Werle, 1992; Allen and Sriram, 2000; Busch, 2000; Bowker and Star, 2000), which provides a compelling account of their power to coordinate design processes. In particular, it is suggested that standards coordinate by homogenising: defining what is standard and conversely, what is non-standard and thus to be avoided. There is also recognition that standards come in many forms. Timmermans and Epstein (2010: 72) differentiate between *design* standards that specify technical properties, *performance* standards that define operation, *terminological* standards that use labels and categories to classify and *procedural* standards that define steps to be taken in any process. In the case of UK offices, several of these types of standards have coordinating effects, explored below in a summary of regulatory and voluntary standards relating to office building design.

In the UK, the law governs building design primarily through building regulations which specify conditions that designers have to meet (Imrie, 2007). These regulations cover issues such as structural, safety and well-being, for example, dealing with the structural loading capacities of different materials and the insulating properties of walls and windows. Others apply to the provision of ventilation/fresh air (driven by historical concerns about 'sick buildings'), lifts and stairs (particularly for emergency evacuation, based on expected occupancy ofthe building) and toilets (again, relating to occupancy).

Since 2010, the energy efficiency *performance* of new non-domestic buildings including offices has been addressed in 'Part L2A of the Building Regulations', addressing the 'conservation of fuel and power' (HM Government, 2013). Part L requirements are set in terms of CO_2 emissions reductions, with the onus on developers and designers to demonstrate that the intended building is designed to have lower emissions than a reference model.[1] However, Part L does not define *how* developers and designers should ensure that their building performs better than the similarly sized and shaped 'reference' building created for comparison. Rather, it focuses on the modelled performance of the design. It is also important to note that compliance with Part L is assessed on the modelled performance of a building's main heating, ventilation, air conditioning (HVAC), lighting and other major systems, using only standardised assumptions about building occupancy. It does not take account of anticipated patterns of occupancy and use, including the energy use associated with computers and other plug-in equipment (van Dronkelaar et al., 2016).

Building regulations are not the only *performance* standards involved. New buildings require an Energy Performance Certificate (EPC) before they can be sold or let. EPCs label the energy efficiency of the building on an A–G rating scale similar to those used to indicate the energy efficiency of domestic appliances (Department for Communities and Local Government, 2012). They are calculated using a similar methodology to that used for demonstrating Part L compliance (i.e., a modelled estimate under standardised conditions, not an estimate of likely real energy consumption). This is fairly typical of the international situation, where to bring coherence to international 'energy standards' for buildings, the EU's (European Commission, 2003) Energy Performance of Buildings Directive only demanded building certificates be based on actual energy performance 'to the extent possible'. A more prescriptive approach based on real performance has been adopted by many EU countries (Economidou, 2012) In the UK, Display Energy Certificates (DECs) also record real performance but are only in use in the public sector. DECs were not extended to private sector buildings under the post-2010 coalition government, although energy audits undertaken as part of the ESOS (Energy Savings Opportunities Scheme) have similar functions (Cohen and Bordass, 2015). Another part of the regulatory framework that applies to building design is planning law. Planning consents are granted based on numerous factors, including maximum height, visual 'bulk' and style, the 'rights to light' of surrounding properties and more. These restrictions on design, while framed by national planning policy, are open to local interpretation and are, in part, negotiable. They are also legally enforceable.

There is a substantial literature on how formal regulations have influenced office design (Hamza and Greenwood, 2009; Pan and Garmston, 2012; Goulden et al., 2015). Regulatory standards are, however, only the tip of the iceberg. There are also voluntary standards which prove to be especially significant in competitive property markets.

In the UK, voluntary standards include BREEAM (the Buildings Research Establishment Energy Assessment Method) and the British Council for Offices' (BCO) Guide to Specification. The BREEAM process provides an evaluation of the 'sustainability' or environmental *performance* of a building, with credits given for diverse features including low carbon energy, green roofs, biodiversity, building location and links to sustainable transport. Credits for specific aspects of a building's heating, cooling and other systems are also

included, and combined to give an overall rating for the building as a whole. Compliance with BCO guidance is also expected within the speculative office development sector. The BCO Guide, updated every few years, was first published in the 1990s with the purpose of helping property developers navigate between over-provision – including unnecessarily expensive and wasteful specifications and – the risk of producing buildings deemed to be 'below standard' in terms of quality and infrastructural provision (Guy, 1998). Compliance with BCO guidelines is now seen as *sine qua non*. BCO guidelines address many of the features also covered by building regulations (toilets, lifts etc.) but add guidance on levels of comfort and provision, for example, for ventilation, cooling and the availability of electrical power ('small power').

A final set of 'quality standards' emerge from cultural understandings and models of what a good quality office looks and feels like. These relate to features such as the faç ade and the aesthetics and feel of office space, alongside service provision. Such cultural standards are somewhat hard to define but are taken for granted and shared amongst actors in office design, development and marketing, as well as by their 'customers', the eventual tenants. The term 'Grade A' is often used as shorthand for this diffuse notion of quality. Although 'quality' means different things to different people (Cass, 2017), informal standards have a powerful influence on design and construction, and in making the market for 'Grade A' office space.

Conceptualising the effects of standards on office infrastructures

Having described the standards that affect office design in the UK, the next task is to conceptualise their effects on the character of offices as infrastructures for work and on the technologies that are incorporated and that link office buildings to electricity infrastructures. We do so by drawing attention to the role of standards as structuring devices within design practices.

Design standards operate in different ways. We can, for example, differentiate between standards dictating provision or performance. The former define the level, number or amount of facilities that have to be provided in a building. Examples include building regulation requirements and BCO guidance on toilet provision calculated with reference to assumptions about occupational density, gender balance and absenteeism. Performance standards instead define outcomes in terms of a standard or an outcome to be achieved (or anticipated) when the building is in use. An example would be the goal of providing a temperature range of 24° C ± 2° C in summer, and 20° C ± 2° C in winter, as set out in the BCO guidance (Gardiner and Theobald, 2014). The numbers of days on which these goals might not be met are also specified (e.g., 'not to exceed 25° C for more than 5% of occupied hours'), but with no restrictions on how to achieve them. Standards in the office sector often straddle these and other categories in Timmermans and Epstein's (2010) typology. For instance, BCO guidance includes *design* and *performance* standards, and an office that is BCO compliant is one that meets the *terminological* standard of 'Grade A'. They also have complex effects on the 'agency' of the various actors involved. For example, whereas prescriptive standards remove design discretion, performance standards appear to offer designers more freedom, though it is often the case that required outcomes can only be achieved in a limited number of ways.

Standards also vary in how they are used and enforced. The mechanisms of enforcement can be distinguished using Scott's (2008) 'three pillars' perspective on institutions, which also reminds us that standards can be both formal and informal (Brunsson and Jacobsson, 2000), visible and invisible (Timmermans and Epstein, 2010). The three pillars position suggests that institutions rest on *regulatory*, *normative* and *cultural-cognitive* forms of legitimacy with corresponding sanctions for non-conformity.

The most formal standards (e.g., planning agreements and building regulations) fit Scott's (2008) *regulatory* pillar, being rules imposed by the state with the threat of punitive, that is, legal consequences. This differs from the *normative* pillar in which collectively shared understandings of what *ought* to be done underpin standards policed through social sanctions: those not following normative standards are perceived to be acting illegitimately. Guidance from an established and recognised institution such as the BCO fits this description. The *culturalcognitive* pillar is closely related to the normative, but involves institutions and standards reflecting basic beliefs about reality and understandings rooted in culture, rather than norms of behaviour. In the case of office design, this is exemplified by beliefs about what a quality, lettable building looks and feels like (i.e., bright, white, cool, with lots of glass). There is no 'hard evidence' to support these beliefs. Indeed, the concept of evidence does not apply to such cultural constructs, but in a social field, they become recognised to the degree that anyone not acknowledging or reproducing such beliefs is viewed as an outcast.

Standards influence the design of office infrastructures in two important ways: by defining provision and performance and by structuring the practices of designers through regulative, normative and cultural forms of policing that constitute the institutional environment in which they operate. Our next step is to show how this structuring operates in practice, and what this means for office design and for office work.

Commercial offices in London T

The following discussion draws on expert interviews with informants in the field of office building design and refurbishment conducted in 2014–2016. These interviews were semistructured (Fylan, 2005) and conducted using a schedule of questions designed to draw out the different factors that determined a building's form, functional and symbolic spaces, and the use of particular systems of heating, cooling, lighting and information technology. We used ten buildings as case studies to provide a focus for interviews and to ground what otherwise would have been abstract discussions. Questions explored the justifications and rationales for specific decisions about the design and the forms of infrastructural provisioning involved.

The case study buildings were selected to reflect different categories of office buildings. They were all located in London, they varied significantly in size from 3,000 to 23,000m_2, and the selection of cases included new build projects (n=6) and major structural refurbishments of 1980s (n=3) and 1960s buildings (n=1). The range of building sizes included in the sample is representative of office buildings in London – properties below 1,000m_2 are too small to be covered by some guidance. All of the case study buildings were developed speculatively (in the years 2010–2015), meaning that the identity of tenants was unknown in early design phases, although in one case an occupier was involved in design discussions. Buildings that are designed with specific owners/occupiers in mind tend to be more varied in terms of servicing. (Manning, 1965) and one reason for focusing on speculative developments was to examine the role of standards and guidelines as proxies for 'real' occupants and to consider the emergence of 'generic' office provision.

Table 7.1 summarises key features of the buildings we studied. This table demonstrates the diversity of the sample, and the fact that almost all were ranked as 'BREEAM Excellent' or better (n=9).

TABLE 7.1 Characteristics of case study buildings (sourced from fieldwork)

Characteristics	*Dominant type*	*Other types*
Age	New Build: n=6	60s: n=1 80s: n=3
Developer type	Investment: n=6	Managing developer: n=4
Location/sub/market	City (3) and West End (3): n=6	Midtown (3) and South of River (1): n=4
BREEAM ratings	Excellent: n=7	Outstanding: n=1 Excellent (older): n=1 Very Good: n=1
Occupancy density designed to	1:10m_2: n=6	1:8m_2: n=3 1:8-1:12m_2: n=1
Heating, ventilation and cooling system	4 pipe fan coil air conditioning: n=4	Displacement ventilation: n=3 Variable refrigerant flow: n=1 Variable air volume: n=1 Chilled ceilings and beams: n=1
Air flow rates	16l/s/person: n=4	No data
Small power base provision	25W/m_2 base: n=6	15W/m_2 base: n=3; 30W/m_2 base: n=1
Small power additional capacity	+10–15W/m_2: n=4	+20–40W/m_2: n=3; None: n=3

Standardising effects

The next section works with Scott's (2008) 'three pillars' analysis to explore how the different standards involved influenced, and in a sense 'standardised' office infrastructures.

Regulative and normative standards

The regulative/coercive pillar is exemplified by the legal requirement to comply with building regulations and secure planning permission. However office building designers have to satisfy a combination of regulative *and* normative standards:

> first of all … they need to pass the building regs and the compliance side … can we make sure that passes whether it's a BREEAM 'Excellent' or something like that?
> *(Building developer and manager)*

Determining how many toilets, stairwells etc. to provide is a matter of following simple standards of provision. In other areas, such as specifying heating, cooling or the speed of lifts, *performance* standards also apply. But

in both cases, building regulations establish a bare minimum which almost every developer will exceed in order to achieve what is deemed to be acceptable in the market. For example:

> Building regs for fresh air is 10 litres a second, but BCO recommends 12 litres to 16 litres. At [building] the client said 16 litres plus 10%. And on cooling loads it was plus 10%.
> *(Architect)*

An EPC and a BREEAM rating are not legally required but they are normatively expected in prime commercial offices. Some of these ratings refer to each other. For example, BCO guidance treats a high BREEAM score as a measure of sustainability and it has become increasingly common for developers and planners to insert BREEAM ratings into contracts with design teams, and as conditions for planning permission. A building services consultant commented:

> Often it's a planning requirement. … the market's changed over the time … [BREEAM] was seen as very much being optional … . Whereas now … you need it for marketing and … corporate social responsibility.
> *(Building services consultant)*

An architect said that

> Our market insists that we're BREEAM "Excellent" … as a company … it's also the standard that we have set for ourselves to achieve.
> *(Architect)*

In practice, compliance with the BCO Guide to Specification is probably the single most powerful normative standard affecting commercial offices. Individuals involved in early design meetings stated that:

> the BCO criteria is where we start.
> *(Architect)*

and

> design standards will be taken from … BCO guides and so forth because why would you do any different?
> *(Building developer and manager)*

The expectation of adhering to BCO guidelines (which becomes a regulatory-normative obligation when written into contracts), means the design process is strongly shaped by these norms. As one architect puts it:

> most commercial offices buildings would be immediately compared to the BCO specification … it's almost like a regulatory must have.
> *(Architect)*

An M&E engineer pointed out that with buildings developed for short-term profit:

> The ability to sell … is of prime importance … a lot of it is a tick box exercise of "does this building comply with BCO?'"
> (Building services engineer).

Another interviewee noted that speculative developers rely on advice from letting agents who stress that:

> what you'll need is BCO spec, BREEAM Excellence, other than that it's up to you'
> (Building developer and manager).

Even the most respected developers were said to:

> 'benchmark all their jobs based on BCO standards'
> (Architect).

But the question remains, *how* do such 'market standards' actually affect design? EPCs and BREEAM do not prescribe particular features of office design, but those we interviewed suggested there are standardised ways of achieving the expected scores in these two assessments. One strategy was to standardise the majority of design features in a building in order to meet the BCO guidelines and achieve BREEAM 'Excellent'. This affects the design process in that following 'standards' obviates the need for one-off calculations, judgements, decisions and favours reliance on default assumptions and measures of provision and performance. To some

extent, guidelines replace the expertise, judgement and autonomy of design professionals and result in 'off the shelf ' optimal solutions. This produces spaces that are relatively predictable, uniform and comparable and it is in this sense that BCO guidance and other 'regulatory-normative' standards define the 'normal' office.

In generating shared understandings of what a 'normal, modern, office space' looks and feels like, standards like these function as a form of non-governmental steering through regulation, but not of a form that is enshrined in law. We explore this process further by considering how such governance operates in the context of office markets.

Market standards and cultural norms

Commercial office buildings are more than sites in which office work is undertaken. An office building is also an investment vehicle and a potentially risky capital outlay that must produce a return, provided by effective real estate management. As one interviewee summarised:

> these buildings are investment vehicles. They are all about providing a return for a pension or … insurance policy
> (Architect).

The financial imperatives of the market and the symbolic power of market-valued buildings (Guy, 1998; Cass, 2017) are therefore interwoven with changing ideas about how office buildings might be used. Meeting the normative standards associated with BREEAM and BCO, is part of this bridging process.

Critically, design standards can be adopted and followed without knowing exactly who will occupy the building or what work practices the office, as infrastructure might need to enable. In terms of architecture, the 'Grade A' cultural model supposes that quality office space will be open, light and airy, and will provide a 'blank canvas' for occupiers. The following observations were typical: 'that's quite important … getting a more open, more airy… sense of openness' (Architect), and 'greater height and space … a feeling of space and volume … you're trying to maximise … floor to ceiling heights … It's a better feel within your floor plate' (Letting agent).

Developers claim that tenants demand such features. They argue that these demands are conveyed through letting agents, through the demands of tenant's representatives in letting negotiations, or through direct interaction between tenants and developer-managers. These exchanges inform the view that tenants want faster lift speeds, marble toilets and larger and more impressive lobbies, in addition to provision for high levels of occupancy, air flow, cooling, etc. However there is a question mark over whether such standards actually reflect common occupier 'needs' and/or whether these are required to enable office work practices. Letting agents were often blamed for proliferating the 'Grade A' standard, in a way that some think is increasingly disconnected from what people actually do in offices. For example, a building services engineer suggested that:

> they'll say to let it you've got to have all glass … you've got to have air conditioning … they say the market wants it … because it looks good … it's not what people really want, but it sells it.
> *(Buidling services engineer)*

Letting agents allegedly push for a quicker letting, 'plug-and-play', 'Cat(egory) A' fit-out, in which the whole of the building is equipped with standardised suspended ceilings, raised floors and pre-installed services. As an architect explained a '"Cat A" fit out doesn't leave you too many options if you're going to do it efficiently … We're very frustrated that we have to incorporate it at all but the agents want it … ' (Architects). Perhaps more accurately, 'Grade A' and other quality standards are designed to deliver offices capable of accommodating all potential tenants and flexible enough to handle changes in tenancies: they consequently deliver a generic infrastructure designed to encompass all possible forms office work but are arguably not ideally suited to any.

All the case study buildings detailed in Table 7.1 are to slightly varying degrees exemplars of the standardised infrastructure that is the 'normal' office. These offices are expected to be rated BREEAM 'Excellent' and to have an EPC rating of B or above. Following BCO guidelines, they are designed to accommodate one person per 8–10m_2 and to provide 16 litres of fresh air per second per person. They often have four pipe fan coil unit air conditioning, and they are assumed to need 25 Watts of heat-gain producing small power provision per square metre of floor, in some areas supplemented by another 10–15W. This level of provision results from assumptions embedded in the standards discussed above about what is acceptable and 'needed' in quality office space.

Lock in, ratcheting and standardisation

As we have shown, standards of various sorts – some requiring certain levels of provision, some specifying expected performance, and all resting on different forms of institutional legitimacy – act together to structure and standardise the design of speculatively developed office buildings in London. Normative standards as represented in the guidelines and assessment procedures of a number of professional industry groups, including the BCO and BREEAM, help shape buildings around a uniform model of form and function. These influences on design and the design process reflect the need to meet and demonstrate industry standards of quality as a precondition for saleability/marketability. Far from being voluntary, the demands of the market bind developers to a very specific, cultural-cognitive model of what a 'Grade A' office building should look and feel like (Cass, 2017).

Standards also interlock in various ways. For example, standards of provision associated with occupational densities (the density at which the floor space will be occupied, measured in square metres per worker) or to small power requirements (Watts per area of floor space) in the BCO Guide assume a uniform, spatially and temporally undifferentiated use of office space, and of office technologies. This leads to further assumptions about levels of heat gain (of the PCs, VDU screens and human bodies presumed to occupy space), which inform decisions about how much ventilation and cooling the building needs. At the same time, cultural expectations of 'Grade A' quality encourage high levels of glazing and suspended ceilings which have further implications for heat gain and airflow. Following both these 'standards' results in the 'need' for resource intensive systems and infrastructures, such as mechanical air conditioning (rather than forms of passive or mixed mode cooling and ventilation) (Shove, Walker and Brown, 2014).

The 'normal' office infrastructure is derived from the interlocking of standards. As illustrated above, the apparent need for air conditioning in the 'normal' office does not result from any single standard or design decision, but is a cumulative effect of multiple standards on multiple design decisions. Since these processes are difficult to unravel, a building that is designed to avoid air conditioning is likely to transgress multiple other standards, and in the speculative office market, few developers are willing to run the risk of non-compliance. These and other interlocking processes sustain the upwards ratcheting of norms, expectations and levels of provision, with implications for energy demand and carbon emissions.

Such ratcheting is not new or unique to office buildings (Shove, 2003). However, the precise ways in which building modelling, redundancy and standardisation combine give this societal trend an endogenous boost. As represented here, this is an unintended consequence of the interlocking of technical and market standards. The 'iPhone mentality' (as one interviewee put it) transforms best practice into an expected minimum, such that:

> What was considered high-tech in one model is considered norm in the next … what was considered to be state of the art in one building, the next generation, well we've got to have it …
> *(Building management systems consultant)*

Standards are, then, both productive of, and a means to achieve, standardisation. Homogeneity and uniformity of provision across office buildings is produced by standards, disregarding variations in work practice in order to ensure that 'normal' levels of provision are maintained and that office space is saleable in a competitive market (Cass, 2017).

Conclusions

In cities around the world and particularly in their Central Business Districts where speculatively developed office buildings are chiefly located, the culturally legitimated extravagances of status-expressing, iconic and apparently unique architectural forms and faç ades hide a closely kept secret. Offices as infrastructures for work, and their forms, functions, spatial arrangements and levels of provisioning, reflect an increasingly homogenised model of 'normality'. We have shown here how the different types of standards that apply in office building design sustain such homogeneity. Regulations backed by forms of coercion, normative standards and guidelines that define acceptability and cultural-cognitive shared understandings of what constitutes a high-quality, lettable office lock together to drive design in certain directions. As a result infrastructures that purport to enable office work reflect reified ideas of 'normality' and are rarely configured to enable actual or changing working practices. Instead, and as we have shown, interlocking standards mean that the 'normal' office is structured around a common understanding of what is 'needed'. For the moment, 'needs' are constituted in such a way that quality offices offer bright, white, airy, air conditioned space

equipped facilities (for small power, etc.) that have come to represent the 'normal' office infrastructure. Such provision in turn requires particular systems of lighting, heating, cooling and ventilation, all of which link to the wider infrastructure of electricity provision, *and all of which* affect the energy demand and the carbon footprint of office work.

There is some evidence that this model of 'the office' is out of sync with the separately changing realities of office life. Research since the 1990s (Stanhope, 1992, 1993; Cook and English, 1997) and more recently (British Council for Offices, 2014) has highlighted that provision, for example of small power, is often of a level far greater than that required by the majority of office work. The British Council for Offices (2013) have also produced empirical analysis of the densities at which offices are actually occupied, which reveals that even with an unrealistically high level of employee 'utilisation'[2] of 70%, 96% of surveyed offices would still be occupied at a lower density than that assumed in the design brief. This means that 'normal' office infrastructure exceeds the levels of provision actually required in the vast majority of cases, most of the time.

This curious situation is, in part, a result of the fact that designers focus on meeting standards and guidelines, rather than on figuring out what office work entails. Ironically, the success of market standards is at the same time evidence of what some might see as market failure – leading, in this case, to buildings that are often over-specified, and that incur unnecessary financial costs for those developing and renting office space, and environmental costs when these forms of provision results in air conditioning and other energy-intensive systems.

Could design standards and guidelines better reflect the realities of office work? The trajectory over the past 20 years suggests we should not be overly optimistic. Over this period, office work practices have changed dramatically. Trends include an increasing move towards home and third-space work, hot-desking in work, the domestication of office space with the addition of catering and leisure facilities and a shift in focus towards tenant well-being (Cass, 2015). All of this has co-evolved with the rise of the internet (from wired to wireless forms) and the replacement of bulky desktops (first by laptops and more recently by tablets). One might expect that these and other developments in the character of office work would have also changed ideas about what a 'normal' office infrastructure should provide. If office designers were responding to these developments, the trend would be towards lower requirements for small power provision, light and thus cooling and air conditioning. Instead we have witnessed a tendency for standards to change in the opposite direction: ratcheting up such that offices provide more of the same. Why has this happened and what would it take for designers to respond to developments in what office work involves? In reflecting on these outstanding questions, it is obvious that we have more to learn about how standards mediate between infrastructural provision and the practicalities of office work.

Notes

1 'Energy conservation' is thus actually assessed as the CO_2 emissions arising from energy use rather than the energy use itself.

2 Utilisation is defined and calculated as 'workplace density divided by the maximum utilisation of workplaces, expressed as a percentage' (British Council for Offices, 2013: 12).

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