Abstract

Purpose – This paper aims to provide a perspective on the office productivity debate, with a particular focus on providing a framework for examining those factors relating to the design and management of the office environment.

Design/methodology/approach – The approach taken has been to examine the plethora of factors that might be involved, principally through a literature review, and then to group these into four generic areas of enquiry. Within each of these, potential measures of productivity are described, and these are connected to building lifecycle decisions.

Findings – Combined, the findings produce a practical framework within which various actors in the design, delivery and management offices can understand and influence the productivity question. In this way, the findings have practical implications rather than simply describing the factors that influence productivity.

Originality/value – The paper develops a report produced in 2017 for the British Council for Offices. Building on the main findings of the original work, this paper expands the literature review, provides more context regarding the significance of office productivity and expands upon the conclusions. The author fully acknowledges the contributions of the whole research team behind the original paper. The originality of the work lies in its development of a framework that can be applied by practitioners in the built environment.

Keywords Design, Efficiency, Productivity, Effectiveness, Knowledge work, Attractive, Healthy

Paper type Research paper

1. Introduction

This paper is based on research undertaken for the British Council for Offices (Greenhill et al., 2017). The original paper examined how the physical design and management of offices can influence individual and organisational productivity. It proposed a definition of a productive workplace, considered how productivity can be influenced by aspects of design and management and set out steps that might be taken to improve performance.

Building on the main findings of the original work, this paper expands the literature review, provides more context regarding the significance of office productivity and expands upon the conclusions. The author fully acknowledges the contributions of the whole research team behind the original paper.

Why productivity is important? Productivity has been of growing importance in corporate real estate management in recent years following a recognition that higher productivity has a disproportionate impact on organisational performance compared to property cost savings (Appel-Meulbroek et al., 2011; Morgan and Anthony, 2008; Palvalin et al., 2017; Thompson and Kay, 2008).

Productivity in the UK lags the G7 average by over 15 per cent (ONS, 2017); and around one-third of UK jobs, ten million workers, are in offices. It therefore follows that if productivity gains can be made there, they will help ease a national problem. Many office workers are “knowledge workers”, whose jobs involve developing and using knowledge rather than producing goods or services. Drucker (1999) described knowledge worker
productivity as “the biggest of the 21st century management challenges”, not least because it is fundamental to sustaining economic growth.

What is meant by productivity? At its most basic, productivity is the ratio between input and output (Tangen, 2005), leading to the perspective that productivity improvement means increasing outputs while decreasing inputs (Misterek et al., 1992). Productivity, however, is not simply a quantitative matter; it also describes how well an organisation uses its resources to achieve goals (Pritchard et al., 2012).

In this sense, productivity can be defined as maximising output with minimum effort or expense while succeeding in producing the desired results. However, where it is the productivity of knowledge workers (rather than manual workers) that is of concern, there are particular features of the work that determine how productivity is understood. The following abridges Drucker’s (1999) summary of these features.

- Knowledge worker productivity demands that we ask: What is the task?
- Responsibility for productivity is on the individual. Knowledge workers have to manage themselves; they must have autonomy.
- Continuing innovation has to be part of the work, the task and the responsibility of the knowledge worker.
- Knowledge work requires continuous learning, but equally teaching on the part of the knowledge worker.
- Productivity of the knowledge worker is not, at least not primarily, a matter of quantity of output. Quality is at least as important.
- Knowledge worker productivity requires that the worker is both seen and treated as an “asset” rather than as a “cost”. The knowledge worker wants to work for the organisation in preference to others.

There are thus manifold ways in which workplace design and management can influence productivity. One of the challenges to describing and measuring productivity is that organisations, teams and individuals have multiple goals, circumstances and motivations, a fact that hinders the use of generic measures.

Another issue is the time taken for the results of knowledge work to become apparent (Packer, 1985). Isolating the output of individuals or groups is difficult within complex and diverse organisations. It is also the case that the factors influencing productivity are very diverse, including “technology, leadership, team spirit, self-management practices and the workers’ intrinsic motivation” and that it is “impossible to include all possible impact factors in one study” (Palvalin et al., 2017). Figure 1 simplifies the factors influencing productivity.

Taking one example: an organisation’s culture and leadership will help determine the degree of alignment between a worker, employer and peers. Where there is close alignment, individuals can deliver positive results even in challenging working environments. Conversely, where individuals are disengaged from their organisation, even outstanding workplaces may not result in the desired results.

This perspective on productivity was captured by Clements-Croome (2015) who recognised the role of extraneous factors such as job satisfaction, social ambience and personal issues. He suggested that there “seems to be a virtuous circle linking health, sustainability and environmental quality. Better building performance is likely to lead to better human performance.” He further suggested that our “surroundings can influence our moods, our concentration, and enhance or detract from our basic motivation to work.”

Given the complexities outlined above, this paper considers only those elements of the design and management of the physical workplace that might have an influence on
productivity. In other words, how physical aspects of the workplace help or hinder productivity and the role of the workplace experience in enabling performance.

2. The productive workplace

The impact of the workplace on people and productivity can be traced back over a hundred years, to Frederick Taylor’s seminal *Principles of Scientific Management* (Taylor, 1911). His basic thesis was that incentive-based wages were ineffective unless they were used alongside carefully planned and managed tasks, backed up by supportive and co-operative management.

The Hawthorne Experiments of the 1920s and 1930s are also frequently cited in the lineage of thinking on productivity. The work found a correlation between lighting and productivity. While the results have been challenged over the years (mainly on the grounds of scientific objectivity and the role of the researchers in influencing the outcomes), they highlighted the positive impact of social factors such as group work, management interest, control over the work environment and working methods on productivity.

The 1960s and 1970s saw the zenith of the post-war corporate behemoths, as globalisation led to complex and many-layered, relatively unchanging organisations. The underlying economy was also beginning its long-term transition from manufacturing to services. Demands on the workplace changed; and as offices and office work evolved, so new approaches were sought to workplace design.

**Open plan and productivity:** one visible symptom was the spread of the open plan office during the 1970s. The designer and inventor Robert Propst foresaw that “the growing complexity of office work, accompanied by growing numbers of office workers, was awakening interest and concern about office productivity” and was concerned to discover how workers could “become more efficient and effective simultaneously” and how the workplace itself could “become more responsive to knowledge workers and their work” (Thompson and Kay, 2008). The result of his endeavour was Herman Miller’s open plan, “Action Office” system in 1968.

Open plan offices were thought to improve internal communications and interaction (Bedoir, 1979; Brunia *et al.*, 2016; Ives and Ferdinand, 1974 and Sundstrom, 1986). They helped office managers by enabling faster and cheaper reconfiguration of space and people; and they were more efficient in terms of increasing occupancy densities, bringing about real

![Diagram of Factors Influencing Productivity](image)

**Source:** Greenhill *et al.* (2017)

**Figure 1.** Factors influencing productivity

Measuring the productive office
estate cost savings. However, the rush to work in open plan came with hidden costs—what we refer to today as productivity costs. 

Brunia et al. (2016) observed that the debate about the pros and cons of open offices is still going on, citing Purdey and Leifer (2012) and Kim and De Dear (2013) as recent examples. According to Chadburn et al. (2017), while some research suggests a strong positive link between design and productivity (Gensler, 2005; Myerson et al., 2010; Sullivan et al., 2013), other work is less conclusive (Greene and Myerson, 2011; Thompson and Kay, 2008).

Technology and knowledge workers: while open plan offices changed the way offices looked, this was as nothing compared to the revolution caused by the introduction of office technology. As early as 1985, Stone and Luchetti (1985) set out to “challenge the customary ways of thinking about offices” and to show how managers could “integrate physical layout, design, and communications to support organizational objectives [...]. These objectives were to emphasise informal exchange, assign people to different work teams and study groups, provide employees with access to specialist equipment, value individual initiative and mobility, derive payoffs from serendipity, attract talented employees and increase productivity while reducing office costs.

Stone and Luchetti proposed that managers should rethink how information and people flow in an office, and adopt “activity settings” to provide a richer experience, with appropriate environments to suit the work in hand. Such thinking contrasted with the command and control systems that had been dominant for so long. It was holistic, purposeful and recognised technology as an enabler, not a driver.

Drucker (1992) predicted that the traditional factors of production—land, labour and capital—would become secondary to knowledge. Today, around a third of the workforce in advanced economies is office-based, mostly engaged in the less tangible “knowledge economy”. Fewer and fewer businesses own physical assets: short-term leases are replacing long leaseholds and freeholds; and capital-intensive plant has yielded to rapidly depreciate desktop equipment. As a result, the greatest asset (and cost) for most organisations today is their people.

As the 1990s unfolded, workplace planning was less about the relationship between the worker and the workplace, but more about that between the workplace and the organisation (Jan van Ree, 2002). Typical of this work was Akinori et al. (1993) who referred to a new and strong focus on the value that corporate real estate added to the organisation. In other words, how does workplace management contribute to better products or services? How does it help the company focus on its core competencies and upon staff productivity?

By the mid-1990s there was a burgeoning library of reference material outlining the implications of the changing workplace (Duffy et al., 1993; Duffy and Powell, 1996; Duffy and Tanis, 1993; Pelegrin-Genel, 1996; Raymond and Cunliffe, 1997; Worthington, 1997). Increasingly, work was seen to be about enabling people to interact and collaborate, underling the wider macro-economic shift from manual labour to knowledge work. In doing so, the office was expected to provide a richer palette of settings in which individuals and groups could work in a far more dynamic fashion compared with much of the sedentary work of the past.

The rise of agile working: Implicit in all of this was that workers would become more mobile, or agile, choosing where and when to work. Increasingly the office was becoming less a place to go to work largely alone on a set of prescribed tasks, and more a place to visit and interact with colleagues. Cairncross (1997) argued that the “office will become a place for the social aspects of work, such as celebrating, networking, lunching and gossiping”. To
cope with this shift in emphasis, office environments would have to be designed to enable increasingly complex relationships to flourish, to be productive.

The ubiquitous impact of mobile phones, laptops, the internet and email all seemed to presage an era in which work itself would be transformed: work could now be conducted in ways entirely different to even a decade previously. Working from home, hotels, trains and indeed just about anywhere was increasingly possible. Not only had the technologies released workers from the “place” issue, they had also created the “anytime” option. Work, as many commentators noted, was quickly being defined as an activity rather than a place.

It is in this context that the role of the workplace in supporting individual and organisational productivity is a critical one that has come under the spotlight of senior management teams. Whereas, in the past, the workplace was seen as a leaden, inert and inflexible cost of doing business, it is now coming to be recognised as a strategic resource that can be actively managed to improve the productivity and well-being of the valuable and costly assets which it houses: the knowledge workers.

3. Identifying features of a productive workplace

While it seems intuitive that the office environment is an important influence over the ability to work productively, the nature of the relationship is complex, reflecting the needs of different types of role, personality and circumstance. Even within the narrower confines of design and management factors, the question of quantification (or translating lost productivity into a tangible number) has proved difficult. As Mawson (2002) noted:

[...] no-one has managed [...] to describe in numerical or financial terms the lost productivity [...] that results from failing to provide people with workplaces that support them in the tasks they conduct.

Despite this limitation, there is plenty of evidence of the relationship between environmental factors and self-reported perceptions of productivity. For example, Thompson and Kay (2008) undertook an extensive review of studies and concluded that there would be an increased likelihood of the workplace impacting positively on workplace productivity if the following features were present:

- control of the immediate environment (e.g. lighting or temperature);
- maximum daylight;
- few visual distractions (when distraction-free working is required);
- lighting appropriate to the task;
- a blend of work settings that reflect business needs;
- flexibility of design and infrastructure to accommodate change;
- good internal air quality;
- spaces for social interaction, relaxation and “psychological restoration”;
- opportunities for learning and information sharing;
- creation of a sense of place and social equity; and
- managed by a customer-focused facilities management function.

Many of these features are linked to the impact of the environment on a worker’s health and well-being, although they also extend into the ability of the space to support different workstyles and to enable learning and information sharing. They also help distinguish between design and management features of the workplace.
Palvalin *et al.* (2017) argued that an appropriate physical environment should facilitate different job activities, communication and concentration, informal and formal meetings and different moods such as being calm and relaxed or being stressed or excited. In so doing, they distinguished quantitative and qualitative worker output. In addition, they made a distinction between individual productivity and team productivity. This is considered to be crucial, because a facilities management intervention might have a positive impact on team productivity but at the same time have a negative impact on individual productivity. For instance, an open setting makes it easier to exchange knowledge, but it also results in more distraction. Overall, the findings suggested a top ten of most important factors to support employee productivity, which is abridged below:

- space for concentration and solo work without being distracted;
- space for communication and interaction, such as visual and auditory accessibility, proximity, central location, facilities and spaces for meetings;
- proper areas to take a break;
- workplace ergonomics (e.g. well-designed furniture);
- access to advanced technology;
- sufficient and appropriate storage space;
- good quality air, lighting and natural daylight;
- personal control over the indoor climate, temperature and air quality;
- fit with psychological needs such as privacy and the ability to personalise; and
- a well-considered implementation process, including appropriate leadership, clear information and communication and well-thought change management.

There are two key messages emanating from the work of Thompson and Kay (2008) and Palvalin *et al.* (2017). First, as the workplace becomes more fluid, so its management will need to become more sophisticated and responsive, including greater co-ordination with other infrastructure areas such as human resources and technology. Second, the productivity question can be simplified into four, related areas of enquiry, as follows:

- efficiency: optimising the use of space, time and information;
- effectiveness: enabling workers to carry out their work;
- engagement: providing a positive work experience; and
- health: supporting and improving individual well-being at work.

In practice, there are considerable overlaps between each area but, in combination, they can remove many obstacles to improving workplace productivity; they can enhance productivity, and they can introduce productivity. They also work at the level of the organisation, the team, and the individual worker.

### 3.1 The efficient workplace

As noted earlier, efforts to improve office space efficiency have a long pedigree. From Frank Lloyd Wright’s Larkin Building in 1904, to the open plan offices of the 1970s, often referred to by designers as ‘burolandschaft’, there has been a focus on improving internal communications and interaction (*Brunia et al.*, 2016). Following the recession of the early-1990s, achieving cost savings through higher densities and furniture solutions became commonplace.
There are two principal means of achieving more intensive use of space. First, space allocations per desk are reduced. For employees in open plan, there is simply less space on or around their workstations; while for others there are fewer enclosed offices. The second step to intensify the use of space is to manage the work environment more dynamically. Many organisations have introduced agile workstyles and desk sharing as a means of improving their use of space, supported by agile work settings. The defining features of an efficient workplace include the following:

- optimising the use of space, time and information;
- efficient access, entry, exit, circulation and navigation;
- minimal time spent looking for spaces, people, information or services;
- optimum use of space through ongoing review of performance and utilisation; and
- high levels of service with a responsive day-to-day management regime.

Despite the advances in workstyles, there have remained substantial concerns about increasingly densely occupied work environments and their impact on workers’ ability to undertake their work effectively (Banbury and Berry, 2005; Block and Stokes, 1989; Hedge, 1982; Leaman, 1995).

High density, highly used office environments impose a set of working conditions on the worker that challenge basic precepts about personal space, co-worker relationships and alignment to employer. For example, such environments de-personalise space: there is little or no scope for personalisation or for the traditional paraphernalia of the office desk (for example, personal effects). Whole floors (sometimes the size of football pitches) can be subjected to a corporate cookie-cutter space plan which can, if not designed and managed appropriately, resemble the featureless production line office layouts of the 1960s and 1970s.

Efforts to maximise efficiency have been shown to have negative consequences in terms of productivity, particularly in terms of increasing distraction (Haynes, 2008a). Mawson (2002) also found that the cumulative impact of distractions is a less productive day. Blackwell (2016) reported a survey which revealed that just over two thirds (69 per cent) of respondents “stated that their workplace design directly affected their effectiveness”. More specifically, 51 per cent reported that reducing extraneous office noise was the most important factor for improving their productivity.

Finally, Brunia and Hartjes-Gosselink (2009) argued that large open workspaces, accommodating more than approximately 15 people should be avoided due to concentration and privacy issues and that large open spaces should be visually and acoustically subdivided in smaller areas.

As well as distraction, the loss of privacy in large open plan environments is thought to reduce productivity. For example, Nathan and Doyle (2002) found that the loss of privacy can affect workers negatively in terms of their overall well-being. In another study, van der Voordt (2004) found that open-plan offices can increase crowding and loss of privacy. While Haynes (2008a, 2008b) and Peterson and Beard (2004) supported van der Voordt’s recommendation that the workplace should provide a palette of work settings to allow for both collaborative and private work.

3.2 The effective workplace
As well as providing an efficient environment to enhance productivity, the workplace is also able to influence worker effectiveness. Studies into effective office design and productivity
have been extensive (including those by Gensler, 2005; Myerson et al., 2010; Oseland and Burton, 2012 and Sullivan et al., 2013). To illustrate the point, while:

[...] many people can cope well with shared use of activity-based workplaces, quite a number of people complain about a lack of privacy, poor support of work requiring concentration and insufficient storage space (Brunia et al., 2016).

For corroborating evidence, refer to the following authors: Appel-Meulenbroek et al. (2011), Brunia and Hartjes-Gosselink (2009), De Been and Beijer (2014), Maarleveld et al. (2009), van der Voordt (2004) and van der Voordt et al. (2012).

Workplace effectiveness is related to workers’ ability to self-manage and self-motivate – key features of knowledge work and agile working. As noted by Palvalin et al. (2017), “planning and prioritizing are very important in a world where available time is limited” and where workers “are expected to be able to cope with the high pressure of many activities at the same time and as such need high self-management skills”.

An effective workplace enables its occupants, which enables its occupants to manage and motivate themselves such as to maximise their productivity: “both well-designed workplaces for concentration and communication and self-management skills have a positive impact on individual knowledge workers’ productivity and team productivity, both quantitatively and qualitatively” (Palvalin et al., 2017). The defining features of an effective workplace are as follows:

- a variety of spaces match the workstyles of the building’s users;
- sufficient quality space for concentration and contemplation;
- spaces for planned and incidental communication and collaboration;
- shared amenity areas to support ad hoc working, recharging and collaborating;
- technology and other resources enable flexible access to, and sharing of ICT;
- appropriate choice in selection of the right place and conditions in which to work; and
- acoustic and visual control enables effective use of each workspace.

Chadburn et al. (2017) undertook a survey of 213 employees in eight financial and professional services firms in central London. Their findings showed that comfort, convenience, IT connectivity, good design and working to a specific time scale were strong drivers of personal productivity.

Greene and Myerson (2011) distinguished four worker types: anchors, connectors, gatherers and navigators, each with a different profile in terms of need for social interaction and mobility. For example, while anchors depend upon places for concentration to be productive, connectors, gatherers and navigators are more productive in more social settings. Knowledge workers prefer a flexible range of office settings that enable both a stimulating open and connected work environment, knowledge sharing, collaboration, as well as, quiet concentration locations, free of distractions and noise. Thus, Van Dierman and Beltman (2016) emphasised the importance of the fit between the individual needs of workers and their workstyles. An effective workplace will provide for these different needs.

In summary, an effective workplace is one which contributes to an occupier’s ability to achieve its corporate goals. It can do this by providing a supportive environment, both in terms of the hard facets of the workplace (layout, servicing, etc.) and the soft facets (such as facilities management and amenities). The required mix of spaces will vary considerably
3.3 The engaging workplace

Efficiency and effectiveness deal largely with physical aspects of the workplace. But in terms of productivity, in an age of relatively footloose knowledge workers, there is then the need to enhance productivity by using the workplace to engage, support, inspire, attract and motivate workers, and nurture a positive workplace experience. Below list summarises the defining features of an engaging workplace.

The more freedom that is gained to work from anywhere, the more significant the design and management of the workplace becomes to make it attractive, or engaging, to workers. As the largest cost for most knowledge businesses, attracting and retaining staff is a high priority for many. Knowledge workers are generally more discerning and selective about who they work for than many workers in previous generations, and so the workplace must be capable of communicating corporate values and culture and engendering a sense of common purpose. Defining features of an engaging workplace are as follows:

- a high-quality people-centric experience through design, technology and services;
- supporting a sense of belonging and community;
- reflecting the corporate brand, culture and values;
- supporting life at work with amenities and conveniences;
- providing motivation, mentoring and career support; and
- providing high-quality facilities services.

The agenda to engage with workers through the workplace has been reduced to a caricature in some case studies. Images of slides, bean bags and pool tables have done little to advance debate, especially given the comments above about meeting the needs of different people (for example, introverts and extroverts).

Changes to the design of the workplace are only effective if there is an empowering workplace culture to support it. When space is designed with purpose, it can play a big role in facilitating behaviour that makes life at work more meaningful; connecting us with others to share knowledge. These new priorities for a more social workplace challenge conventional planning and management and suggest that workplaces must evolve from static containers of routine work into intensively used hubs of social connectivity and interaction.

Embracing this new dynamic model requires space, technology, operations, human resources and services to align seamlessly and deliver a user centric experience where people become part of a community, share ideas, network and have evocative experiences. We can learn from the best co-working environments, where besides the shared physical space, they curate authentic experiences and offer online collaboration for their members by providing a private social network, discussion forum, or a fully-fledged collaboration platform turning the co-working space into a “smart” connected environment.

3.4 The healthy workplace

Efficient, effective and engaging are all critical parameters for a productive office. However, there is one further aspect: to thrive at work, workers must be able to work in a healthy environment. The workplace must provide good environmental control systems: ergonomic furniture, sanitary conditions, access to nutrition and hydration and the opportunity for
physical movement. To work at their best, peoples’ physiological and psychological states need to be nurtured. However, it is often the case that poor design and environmental conditions have a negative impact. The defining features of a healthy workplace are as follows:

- supporting and improving individual well-being at work;
- a safe and secure environment;
- active design features that encourage movement;
- ergonomic work settings and furniture that support a range of workstyles;
- comfortable light levels with access to natural light;
- connection to nature through natural materials, views and green spaces;
- optimum indoor air quality and temperature range;
- a clean and tidy environment; and
- access to good nutrition and hydration.

It is widely accepted that the costs of work-related stress and illness are growing, and yet very little attention is afforded the place where many people spend the majority of their waking hours: the workplace. Designing the workplace to support people’s well-being makes business sense: even a modest improvement in employee well-being can have a financial implication for employers – one that is many times larger than savings associated with property costs.

The *Financial Times* recently reported on an annual survey investigating healthy workplaces (*Smith, 2018*). The 2017 survey covered more than 30,000 employees in 167 UK companies. The results showed that an average of 30 days per worker over the year were “lost to absenteeism or presenteeism (when employees come to work but are not productive)”. This represents 12 per cent of 252 working days in the UK in 2017. Moreover, the survey noted that the trend is worsening.

It is widely recognised that there is a global wellness challenge, as the annual costs (not least in terms of lost productivity) of work related stress and illness continue to grow. While it is self-evident that a healthy workplace in itself cannot solve the wider issues of well-being, the buildings in which many people spend large proportions of their waking hours can have a powerful impact on both physical and mental health.

Designing and managing the workplace to support well-being therefore makes business sense: even a modest improvement in employee wellness, can have a major financial implication for employers – one that is many times larger than any financial savings associated with an efficiently designed and operated building. One respondent to the *Financial Times* survey cited above reported an eight-fold return on investment in wellness programmes through reduced absenteeism and improved customer satisfaction (*Smith, 2018*).

Research has shown that cognitive performance scores of workers in improved indoor environments with low levels of volatile organic compounds and higher ventilation rates are on average double those of workers who work in conventional environments (*Allen et al., 2016*). A greater connection with nature decreases stress and enhances mental well-being.

The World Green Building Council (2014) identified a number of key factors in creating healthier and greener offices which can impact on the bottom line:

- indoor air quality and ventilation;
- thermal comfort;
While the WGBC study took a systemic approach to workplace features affecting productivity, others have taken a more detailed look at specific elements. For example, Veitch (2005) proposed that people have a preference to natural lighting over artificial lighting, and that there is a link between natural lighting and improved productivity. Clements-Croome and Baizhan’s (2000) analysis showed that “the most common complaints about unsatisfactory environments” were connected with high or low temperature variations, stale and stuffy air, or, dry or humid air. Mulville et al. (2016) found that indoor air quality has been shown to have a significant impact on occupant health, well-being and productivity.

Clements-Croome (2015) noted the importance of ventilation, comparing it to the human need for water and highlights the interrelationship between ventilation rate, temperature and humidity noting that increasing levels of ventilation are required to maintain feelings of “freshness” as temperatures increase. Finally, Miller et al. (2010) argued that “green” buildings improve productivity and reduce absenteeism. Their survey of over 500 environmentally certified buildings found their workers to be more productive, reduce absenteeism and improve attraction and retention of staff.

The overwhelming evidence suggests that an organisation’s ability to nurture an engaged, healthy and productive workforce can be significantly reduced by the quality of the working environment. Some of this can be overcome by active design to deliver and manage workplaces that energise, encourage social interaction and collaboration, enhance personal control and provide services and support to improve people’s quality of life at work.

4. Lifecycle productivity

Workplace productivity can be influenced at different stages of the workplace lifecycle. Decisions made, for example, during building design can have long-term consequences for comfort. Leaman and Bordass (2005) described the “killer variables” that affect productivity, including immediate factors such as personal control, work groups and responsiveness, but then included building depth and “design intent”.

It is therefore helpful to consider productivity at all stages of the workplace lifecycle. In this sense, it is helpful to consider building features and management strategies using Duffy’s (1990) layers of building longevity, as shown below.

- site: location, physical setting accessibility;
- shell: building structure, configuration and depth;
- services: mechanical and electrical services;
- scenery: interior layout and the furniture and interior design; and

It is also important and appropriate to add a fifth dimension to Duffy’s construct, namely, support services, thus:

- support: building management and facilities services.

This categorisation provides a structure to frame specific building features and their interrelations, and is also a useful way to determine the likely intervention points by
different parties. For example, a developer would focus on the site, shell and hard services aspects, whereas an occupier refurbishing an existing property is more likely to be concerned with the scenery, setting and support provision. Table I shows one example for each of shell, services, scenery and support, and how they influence the efficient, effective, attractive and healthy elements of the productive office.

5. Measuring the productive workplace

To be meaningful, measures of productivity must ultimately link into the key management metrics used by the organisation. Priorities will vary between organisations and teams within the same organisation.

Greenhill et al. (2017) described an approach to measuring the productive workplace by defining the factors that link the workplace and an organisation’s strategic objectives. Initially, the organisation’s strategic objectives drive the workplace brief. The workplace brief will help define the physical characteristics of the workplace and the features of the user experience. Combined, these will determine how the workplace performance is measured (which will vary between different organisations). These are then linked directly back to the strategic objectives. Feedback on the performance of the workspace and the user experience then contribute to the ongoing refinement and development of the workplace brief.

Many organisations already routinely measure workplace performance, using measures such as turnover and employee engagement. The same workplace outcomes will be applicable to a greater or lesser extent to most organisations although priorities and acceptable standards will differ. For example, the ability to effectively concentrate is likely to be relevant to all organisations, but its priority is likely to be higher for organisations where people spend large amounts of their time in the office in comparison to those where the office is seen primarily as a meeting point for communications and collaboration.

Workplace performance measures will be influenced by a wide range of factors, only a few of which relate to the physical workplace environment. Nonetheless, it is important to track these measures because, together with information on user experience, they can indicate the significance of any problems with the physical workplace which can be used to demonstrate the need to make necessary changes.

Some of the workplace performance measures that most directly influence an organisation’s productivity performance are shown in Table II, together with suggested performance measures and approaches to measurement. There is no need to use these specific measures if similar information is already being gathered for performance management purposes.

6. Conclusion

Productivity is an issue of national concern, and one that is increasingly difficult to measure as knowledge work grows relative to manual work. Output-based attempts to quantify productivity in the office workplace have proved notoriously difficult, due in large measure to the intangible nature of much of the work that takes place in contemporary office settings.

There is now a widespread acceptance in the design, development, occupation and management communities that the productivity of office workers is directly related to their sense of physiological and psychological well-being. The research demonstrates a clear link between the work environment and well-being; and there is an emerging focus on designing and managing places that energise, encourage social interaction and collaboration, enhance personal control and provide services and events to manage and improve people’s quality of work experience.
<table>
<thead>
<tr>
<th>Workplace feature</th>
<th>What does this look like</th>
<th>Link to workplace productivity</th>
<th>Guidance and tools</th>
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</thead>
<tbody>
<tr>
<td><strong>Shell</strong></td>
<td><strong>Daylight, view of nature and glare control</strong></td>
<td>Healthy; Engaging Daylighting, views and glare control are vital to visual comfort in workspaces. Daylight is directly related to regulating our natural body clock. Avoidance of glare removes the risk of visual discomfort and distractions. Occupant glare control is important for occupants</td>
<td></td>
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<tr>
<td>Windows and floor plate depth and form determine daylight penetration in the building. Regularly occupied spaces have a view out of a window and to nature – greenery, trees, landscape or sky. High window to wall ratio and windows are distributed across the building.</td>
<td></td>
<td></td>
<td>BREEAM Criteria HEA 01 – Daylight factors; 95% of workstations are within 7m of a wall with a view out. Occupant survey – satisfaction with daylighting and views out</td>
</tr>
<tr>
<td><strong>Services</strong></td>
<td><strong>Temperature controls</strong></td>
<td>Effective Temperature control and perceived temperature control is key to occupant comfort and will contribute to quality spaces</td>
<td>CIBSE Guidance. BCO Guide to specification section 6.2.2. BREEAM HEA 04. WELL building standard feature 82</td>
</tr>
<tr>
<td>The temperature control solutions for each zone and space are appropriate for the type of work and function of the space. Adequate control for the occupants either through room controls, or choice of where to work.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Scenery</strong></td>
<td><strong>Efficient wayfinding and circulation</strong></td>
<td>Efficient Providing clear routes for navigating reduces the amount of time lost moving through the space, finding rooms, people and teams. In larger, open plan buildings, effective zoning can help improve sense of place and community</td>
<td>Does the interior layout and signage support efficient occupant flows through the building? WELL building standard feature 99 Beauty and design II – spatial familiarity</td>
</tr>
<tr>
<td>Easy to use, attractive and well signed for navigating the space. Incorporate delineation between spaces with different functions or zones. Side cores for lifts and stairwells so that upon arrival, people know where they are on the floor.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Support</strong></td>
<td><strong>Clean and tidy environment</strong></td>
<td>Healthy; Efficient A clean and tidy environment supports individual mental well-being, makes the space more attractive, and effective storage solutions support optimal use of space within the space. Cleanliness and tidiness are cited as problems in many offices</td>
<td>Occupant survey – satisfaction with cleanliness and tidiness</td>
</tr>
<tr>
<td>Well maintained facilities and services throughout the building. This will include quality cleaning contracts, supportive Facilities Management helpdesk and appropriate (size, location, accessibility) storage solutions.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table I. Life cycle considerations of productivity
This paper suggests an input-based approach, focussing on those factors associated with the physical work environment that can either impede or enhance productivity. If the former can be minimised and the latter optimised, then there will be a positive impact on worker output.

This approach also fits well with best practice in corporate real estate management, where the workplace is increasingly seen as a strategic resource that can be actively managed to improve the productivity of the valuable and costly assets which it houses: the knowledge workers.

The paper has demonstrated the manifold physical influences on productivity in the modern office workplace, and has grouped them into four generic areas of enquiry:

<table>
<thead>
<tr>
<th>Factor</th>
<th>Performance measures</th>
<th>Approach to measurement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Healthy workplace</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Absence</td>
<td>Days absence (days/FTE/year)</td>
<td>Review of HR records</td>
</tr>
<tr>
<td>Presenteeism</td>
<td>Number of days worked when unwell (days/FTE/year)</td>
<td>Response to question: &quot;How many days in the last x months have you worked despite not feeling well enough?&quot;</td>
</tr>
<tr>
<td>Poor health well-being</td>
<td>Records of health complaints</td>
<td>Review of HR records</td>
</tr>
<tr>
<td></td>
<td>Perceived level of well-being</td>
<td>Agreement with survey questions: &quot;My organisation sees my wellbeing as a priority&quot;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>&quot;My workplace supports my physical wellbeing&quot;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>&quot;My workplace supports my emotional wellbeing&quot;</td>
</tr>
<tr>
<td>Efficient workplace</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Efficient use of space</td>
<td>Space occupied</td>
<td>HR and estates data</td>
</tr>
<tr>
<td></td>
<td>Space utilisation (% of desks occupied)</td>
<td>Utilisation surveys or alternatively, direct data on, for example, meeting room occupancy from room management systems</td>
</tr>
<tr>
<td>Efficient use of time</td>
<td>Perceived ability to work efficiently</td>
<td>Response to survey question: &quot;How much time do you lose each week as a result of the inability to work efficiently?&quot;</td>
</tr>
<tr>
<td>Effective workplace</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Communication</td>
<td>Awareness of organisation</td>
<td>Agreement with survey questions: &quot;I know what is going on in my work location&quot;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>&quot;I know what is going on in my organisation&quot;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>&quot;My team work together to improve the service we provide&quot;</td>
</tr>
<tr>
<td>Collaboration</td>
<td>Degree of effective collaboration</td>
<td>Agreement with survey questions: &quot;I work with others on a regular basis&quot;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>&quot;I find it easy to collaborate with others&quot;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>&quot;My team work together to find ways to improve the service we provide&quot;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>&quot;When I talk about [my organisation] I say &quot;we&quot; rather than &quot;they&quot;&quot;</td>
</tr>
<tr>
<td>Concentration</td>
<td>Ability to concentrate</td>
<td>Agreement with survey question: &quot;I'm able to focus and concentrate when needed&quot;</td>
</tr>
<tr>
<td>Engaging workplace</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Employee engagement</td>
<td>Level of employee engagement</td>
<td>Agreement with survey questions: &quot;I’m proud to tell others I am part of my organisation&quot;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>&quot;I’d recommend my organisation as a place to work&quot;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>&quot;I feel a strong personal attachment to my organisation&quot;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>&quot;My organisation inspires me to do the best in my job&quot;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>&quot;My organisation motivates me to help achieve its goals&quot;</td>
</tr>
<tr>
<td>Employee turnover</td>
<td>Turnover rate (%/year)</td>
<td>HR records – average FTE headcount per year divided by number of people leaving the business</td>
</tr>
<tr>
<td></td>
<td>Reason for leaving</td>
<td>Number of leavers identifying workplace factors as material to their decision to leave</td>
</tr>
</tbody>
</table>

Table II. Measures of workplace performance

Source: Greenhill et al. (2017)
efficiency, effectiveness, engagement and health. It has also placed these in the context of the workplace lifecycle elements of site, shell, scenery, settings and support. In this way, it provides a framework within which designers, developers, owners, occupiers and managers of office space can bring about improvements in work environments that will have a direct and positive impact on productivity. The framework can be used in its entirety or in a piecemeal fashion to address specific issues; it can be adopted and adapted to suit local needs.

The framework provides everyone involved in the provision, occupation and management of office space with a rigorous approach to understanding workplace productivity, and a means of gathering regular feedback on workplace performance. In doing so, evidence-based decisions can be made, and initiatives instituted that will contribute to more productive workplaces.

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