THE PSYCHOLOGICAL AND PHYSICAL NEEDS OF WORKERS IMPACTING OFFICE DESIGN

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Abstract

Office design needs to be based on the needs of the most important producers of profit and value for any organisation – the workforce. Drivers affecting office design have been economics – space being often viewed as a cost-centre rather than a business enabler; and more recently, ideas that office design can impact organisational culture – resulting in the adoption of more collaborative working spaces in an attempt to force interaction. What is not always considered are the actual working styles of the individuals and their motivations nor the requirements of the work itself. There is a need to profile not only the workforce, but also the work carried out. Recent research into space requirements for work is reviewed and reported with recommendations for better consideration of the psychological and physical needs of workers for office design.

Key Words:
Worker needs; work characteristics; environmental psychology; office space.

1.0 Introduction

How inspiring is your office? If you are reading this, you can probably be classified as a knowledge worker – someone who works with information to create new ideas and knowledge. Yet too many designs for workplaces adopt the uniformity of a "Dilbert" style set of cubicles in open plan layouts. Indeed, Heerwagen (2004) suggests that spaces for accommodating animals in zoos are designed with more thought and attention to the needs of the occupants than many current office spaces. If people are employed increasingly for their knowledge, and abilities to work with complex problems (Johnson et al. 2005), they need inspiring spaces to be at their most innovative and creative (Raisbeck, 2006). Many designers are offering workspace layouts that accommodate team working, informal and formal meeting spaces and private spaces. In response to growing cost-of-space pressures and an increasingly technologically mobile workforce, able to work from anywhere, organisations are adopting alternative officing strategies - exploring alternatives to traditional space, such as collaborative spaces, virtual offices, hotdesking, flex space, and home offices (Gibson, 2003). But many still value the presence of staff in their office premises, since this is where interactions and the

potential for collaboration and innovation can be fostered. Bringing people together differently creates synergies and the potential for cultural changes in work practice (Duffy et al. 1993). What are the ingredients that are likely to encourage these encounters that are thought to enhance creativity, innovation and add value to the organisation's bottom line? How can the needs of task performance be accommodated in today's office – whether it be collaboration or concentrated solo work? Any space strategy must also take into account the psychological needs of the workers – from offering stimulating new challenges or making friends or feeling valued at work. With the challenge of insufficient projected numbers of skilled workers likely to be in the workforce in the coming decade, (Johnson et al, 2005), it is important to recognise and try to meet the differing motivations and expectations of the different generations in the workforce – attracting and retaining the brightest and best will be essential.

2.0 Employee Motivations

A survey by McKinsey consulting and the Boston Consulting Group (reported by Purdey, 2003) found that the top two environment factors affecting motivation are opportunities for personal development and having a sense of shared purpose. The culture and values of the organisation will obviously influence how well these desires are met. Allsteel (2007, p.6) research suggests : "One way to impact retention and encourage creativity and productivity from workers is to create an office space that makes them feel valued, inspired, and part of an affinity group." Besides generalised motivations such as these, each generation at work has its own characteristics and needs from work.

The current workforce is composed of mainly three generations – Baby Boomers (born 1946-1964); Generation X (born 1965-1976); and Generation Y (born 1976 onwards). Each group has its talents and strengths, but the workplace needs to cater for their differing expectations and motivations (Fralix, 2006; Nelson, 2007). There is a projected massive shortfall in employees as the Baby Boomer generation retires – taking its knowledge and expertise with it (Allsteel, 2007). Whilst Baby Boomers may be loyal and committed, with work as a motivator in its own right, Boomers enjoy new experiences and, facing retirement, will value more free time or flexible working. They will appreciate reward and status. Gen X and Y may be more mobile – committed to the work, but not necessarily to a particular employer. They seek autonomy and challenge and opportunities for learning and growth – and they expect to have fun at work. These younger workers are comfortable with technology and like frequent communication. Younger workers especially are comfortable with collaborative work, and consider such activities normal (Allsteel, 2007). Organisations need to recognise and provide for these generational preferences. These expectations need to be turned to good effect so that all generations at work remain motivated and productive employees.

2.1 Theories of behavioural psychology applied to the workplace

People are largely driven by their needs. Work can satisfy a large number of these – such as status, recognition, relationships, rewards, respect, autonomy, trust, and equity. Davies (2005) argues that for a worker to be productive and committed, the reward structure and work itself, needs to be aligned with what the worker him/her-self values. Workplace psychology has a number of underpinning theories of motivation and commitment that to try to predict and influence worker behaviour – and thus their productivity. Maslow's pyramid or Hierarchy of Needs is probably the best known with the bottom levels of security and safety often depicted as being supplied by the comfort and convenience of the environment itself. Esteem needs in a workplace can be met by relationships with co-workers and feeling valued and recognised (Davies, 2005). Herzberg's two-factor motivation or "hygiene" model covers job content and job context (Herzberg et al. 1959). According to the theory, job content motivational factors are described as increasing job satisfaction, whilst a number of hygiene or job context factors, if not operating well, will cause job dissatisfaction (Davies, 2005).

Vischer (2006) further identifies "stress/arousal" theory whereby a certain degree of arousal is necessary for people to feel challenged and therefore stimulate cognitive processes. However, too much arousal (complex job demands, not enough time) can lead to stress and reduced productivity. Too much stress can be demotivating as workers feel they lose control over their work productivity (Oseland, 2009) and this reduces a willingness to co-operate with other workers (Vischer, 2006). Degree of control and connectivity are further linked by the 'Edge of Chaos' theory. Price(2002) suggests that this becomes a description of complexity, and could be applied to analyse office environments. The greatest innovation may occur at a critical level of connectivity – but with too much connectivity, individuals may feel too stressed and retreat to a 'haven' or quiet space - ie retreating from chaos. With too much going on, people may experience cognitive overload (Heerwagen et al. 2004).

Individual personality traits such as extroversion and introversion can also influence a worker's satisfaction with office layouts – Vischer (2006) reports research suggesting that extroverts are more likely to be comfortable in open plan work situations with the likely increased number of interactions and their greater comfort with higher levels of arousal (Oseland, 2009).

2.2 Evolutionary needs – we are still animals

A new area of workstudy is that of evolutionary psychology (Oseland, 2009). Humans have evolved over many thousands of years with certain innate needs that will still be expressed in the workplace.

The need to socialise can be accommodated in common areas and informal break-out spaces whilst the need to retreat to "recharge" in quiet spaces can be accommodated in offices – provided the quiet spaces for contemplation and concentration are indeed quiet, without interruptions. But too little socialising will lead to a sense of isolation.

Whilst people are social, wishing to have a shared common purpose and be part of a community, there is a limit to the number of members of a social group – found to be around 150 by anthropologists (reported by Oseland, 2009) based on the cognitive capacity of the brain. This has implications for office floorplate layouts – they should be restricted or divided to give people a sense of community, within a group size or 'village' they can relate to.

Territoriality can be seen expressed through personalising space and recreating privacy. Many open plan offices are divided up by the occupants into smaller hubs using filing cabinets to reduce the lack of visual privacy and identify smaller team areas. Insufficient space between desks could also create discomfort through insufficient 'personal space'. Hotdesking may not allow sufficient personal space and feelings of intrusion may be generated (Oseland, 2009). Personalising space is also an essential need, it creates a sense of identity, communicates status and helps mark territory (Marquardt et al. 2002). Haynes (2007) reports studies where staff were not allowed to personalise their space resulting in reduced satisfaction with the work environment and job satisfaction.

People need easy 'wayfinding' in spaces. They are used to being able to see across space to find their way around and use visual markers (Heerwagen et al. 2004; Oseland, 2009). Visual connectivity also enables them to see who may be available to recruit into conversations (Heerwagen et al. 2004).

Further 'animal needs' include our attraction to natural settings or 'biophilia (Heerwagen, 2004). People report greater satisfaction with their work setting when they have natural daylight and access to views, and this promotes positive moods (Heerwagen et al. 2004; Heerwagen, 2004). Even something as simple as plants in the workplace can help meet this need.

The design of the workplace needs to allow the expression and satisfaction of these individual and innate human needs and motivations. Its importance is confirmed by an employee motivation/satisfaction survey reported by CABE(2005) where 94% of respondents said that they regarded their place of work as a symbol of whether or not they were valued by their employer. Workplace design also needs to encourage the greatest productivity from its workforce. Spatial layouts are thought to influence ways of interacting and connectivity – meeting some of the human

basic needs for community and socialising, whilst also being thought to stimulate innovation and creativity.

3.0 Spatial Layouts And Work Processes

Facilities management practice encourages office space to be regarded as a tool to support work rather than merely a cost centre (CABE, 2005) and workplace gurus such as Duffy, propound the thesis that changing workspaces can introduce new ways of working, change workplace culture and increase the effectiveness of the workforce (Duffy et al. 1993). The basic premise is that spatial arrangements of office space can stimulate informal interactions and encourage social networks and that these will then lead to increased effectiveness, collaboration, innovation, creativity and thus aiding productivity – essential to maintaining competitive edge, and adding value to customers. However, simply changing from formal private offices to open plan will not necessarily create a change of culture nor beneficially affect communication patterns. Indeed, Sailer et al. (2008) and Price(2002) report contradictory results from studies analysing communication patterns when organisations moved from enclosed offices to open plan. The attitudes of top management in creating an atmosphere of trust when implementing these flexible space-change initiatives is considered to be a most influential factor on success or failure (Price, 2002; Allsteel, 2006).

3.1 What does work entail?

The basic paradox for any organisation today is providing space for both concentration and interaction and the ability to transition between the two. Extensive surveys by BOSTI associates (Brill et al. 2001) has found that workers spend at least 75% of their time in their office, with over half of that time on tasks requiring concentration (Olson, 2000). Workers also need to spend time interacting and collaborating with others – up to 58% of some workers day can be spent like this (Duffy and Tanis, 1999). Why is interaction so important to business? As Heerwagen (2004, p.3), points out, "Innovation arises from those social interactions in which concepts are shared and merged with others to create a collective understanding and a shared vision." Teamworking and collaboration are thus seen as potentially highly productive forms of work, considered to create new ideas and share tacit knowledge (Allsteel, 2006; Price, 2002) – yet their requirements are very different from concentrated tasks. How to mix the requirements for noise-making activities and accessibility for interaction with the need for quiet and undisturbed workspace continues to challenge designers (Haynes,2007; Davies, 2005). Whilst quiet concentrated work can obviously be accommodated by private offices , or by privacy screening and acoustic shielding, plus office protocols about interruptions, what are the requirements to create interactions and collaboration?

3.2 Communication - interaction and collaboration,

Space Syntax studies (Hillier, 1996; Sailer et al., 2007) and social network analysis (Steelcase, nd (i)) seem to be providing statistical proof that spatial layouts influence interactions. Space Syntax analyses space layouts for their levels of supporting functionality – common routes and nodes where interaction takes place being most commonly identified (Peponis, 2004). Social networks increase interaction through sharing common space and visual connectivity – ie being seen more often. Sailer et al (2007) for instance found that in a particular organisation, changes in the office layout increased one freelance employee's connections from a few discipline-based connections to many throughout all levels and disciplines of the organisation. Further, being seen more frequently correlated with increased ratings of mutual usefulness.

Organisations can dictate or 'program' the type of interactions between visitors and staff through their building layout (Sailer, 2007). Some buildings may be highly programmed (think of a court building where routes and access are strictly pre-determined and controlled) or loosely programmed (university departments have relatively few restrictions on access either for visitors, staff or students, consequently routes used or the 'flow' through the building are more fluid). Floor plans themselves can encourage certain routes through a building. Informal interactions that help develop friendships and allow quick information exchanges are most affected by visibility, distance and floorplan layout. Distance between staff acts as a main determinant of interaction – people are not willing to walk far and proximity of important adjacencies should therefore be thought through (Serrato, 2003; Heerwagen et al. 2004). Meeting spaces for formal or informal interaction should be located along the most frequent paths of movement (Shpuza and Peponis, 2005) otherwise they will be little used (Heerwagen et al, 2004). Fishbone and grid floor layouts are more likely to generate high degrees of connectivity, integration and interaction than corridor or 'racetrack' arrangements (Shpuza and Peponis, 2005).

Office spatial layouts can therefore be seen to increase or stimulate social and information sharing networks.

3.3 Interaction or collaboration

However, there is a qualitative difference between interaction and collaboration (Purdey, 2003). Interaction is about information exchange. Interactions can be intended or unintended (Heerwagen et al., 2004) and are essentially work or social information exchanges – dropping by someone's office to

ask a question may be spontaneous but is intended; other more serendipitous conversations happen in corridors and by the coffee machine or water cooler. Increases in technology are transferring many of what were personal contacts into emails and mobile phone texting – some will do this rather than walk down a corridor to see someone. These technological advancements have allowed interactions to be location-free – working from home or remote locations does not stop the sharing of information.

Collaboration on the other hand requires sharing space and time. Collaboration, in the context of an organisation, "reflects more purposive relationships that involve a desire to solve a problem, create shared purpose, discover or generally to produce meaningful outputs", (Purdey, 2003, p. 2). Essentially collaboration is about creating a community. Collaboration should engender the commitment and trust essential to knowledge working.

Whilst Heerwagen et al. (2004) and Sailer et al. (2007 and 2008) identify the increased number of interactions that certain spatial layouts can encourage, their methodology does not necessarily identify increased collaboration. Indeed, Heerwagen et al.(2004) identify that "Given the high interest in the topic of collaboration, there is a surprising dearth of research on the link between collaborative work processes and space," (Heerwagen et al. 2004,p.520).

4.0 Work Characteristics

Efficiency and effectiveness are two different ways of viewing the generation of outputs from inputs. Efficiency is about getting the most output from the inputs, effectiveness is about getting the right kinds of outputs. Most work involves a mixture of routine tasks that ideally are performed efficiently, whilst knowledge work requires cognitive tasks that are all about effectiveness. How can the workspace assist with new knowledge creation? With increasing information, indeed information overload, it is essential that the workspace (the individual workstation) allow an individual to manage the information they feel is relevant to their task – be it relatively routine or knowledge work requiring the assimilation, synthesis, problem solving and creative leaps to create new knowledge.

4.1 Managing information

Effective managing of information requires some level of organisation - Steelcase (2006) research suggests there are 6 styles that are typically adopted: Concierge, Keeper, Processor, Broker, Player, Specialist – each keeping their own collection of information to-hand in various stages of work – active, anticipated and archived. The Specialist is likely to have larger information resources of 'active' information and need more uninterrupted time to concentrate; the Concierge is at the hub of an organisation with high levels of interaction and largely logistics oriented. Each information

management style has differing needs for space – storage, work surface, or collaboration, and recognising these needs results in differing workspaces. Knowing this, an organisation can design workstation space-standards based on configurations that work best for their employees. If information management is linked to the concept of usability (Usability Net, 2006), then not only is workspace analysed for effectiveness and efficiency, but also for usability which can engender increased satisfaction – the occupiers require less effort to complete tasks and achieve their goals.

4.2 Knowledge worker styles

Voltren (2010) suggest that in addition to information management styles there are differing ways knowledge workers use their office – in terms of their mobility and 'radius of action.' The Anchor spends 90% of their time in their office, what will be important to them is acoustic shielding and workspace comfort; the Connector does just what the name implies, and can be found spending at least half of their time wandering through the building, talking to people to see that information flows to who needs it; the Gatherer spends much of their time on customer visits and external meetings, but when in their office they need somewhere to concentrate; the Navigator is almost always travelling – work will be done where they are. When in their base office they need space for meetings. This typology ties in well with the alternative officing strategies many companies are adopting.

4.3 Work processes and their requirements

Work requiring high levels of concentration or task difficulty needs to be undertaken with few interruptions (Marquardt et al., 2002). Workers, in the depth of thought, can experience 'flow' – a state of meta-processing of information and creativity (Heerwagen et al. 2004). Even a short interruption – to answer a question, or a phone call, can cause a break in the thought process, leading to lost time as the chain of thought has to be recovered. Situations that do not allow for the depth of concentrated thought to develop unhindered, mean that workers will often take an easier route to a solution and suboptimal solutions may result (Davies, 2005). Overheard conversations can also be highly disruptive. Acoustic shielding and separation – or the opportunity to relocate to quiet spaces – is essential (Davies, 2005).

Information exchange through interaction is also seen as essential by the knowledge worker (Olson, 2000). Most collaborative work occurs in dyads – usually between co-located workers (Steelecase, nd (ii)). Knowledge work entails three types of collaborative work process – creative, problem-solving and knowledge transfer (Allsteel, 2006). Knowledge transfer may work best in traditional conference or meeting rooms; problem-solvers will need proximity rather than shared spaces; and creative work needs display space to keep ideas visually available for the life of a project. Creative problem solving

work requires dedicated team spaces where the team can set up their own demarcated territory and leave their thought processes on display (post-its, white boards, other 'cognitive artefacts') as aids to memory and further creative thought (Augustin and Brand, 2005). This space helps create collegial cohesion and a shared identity.

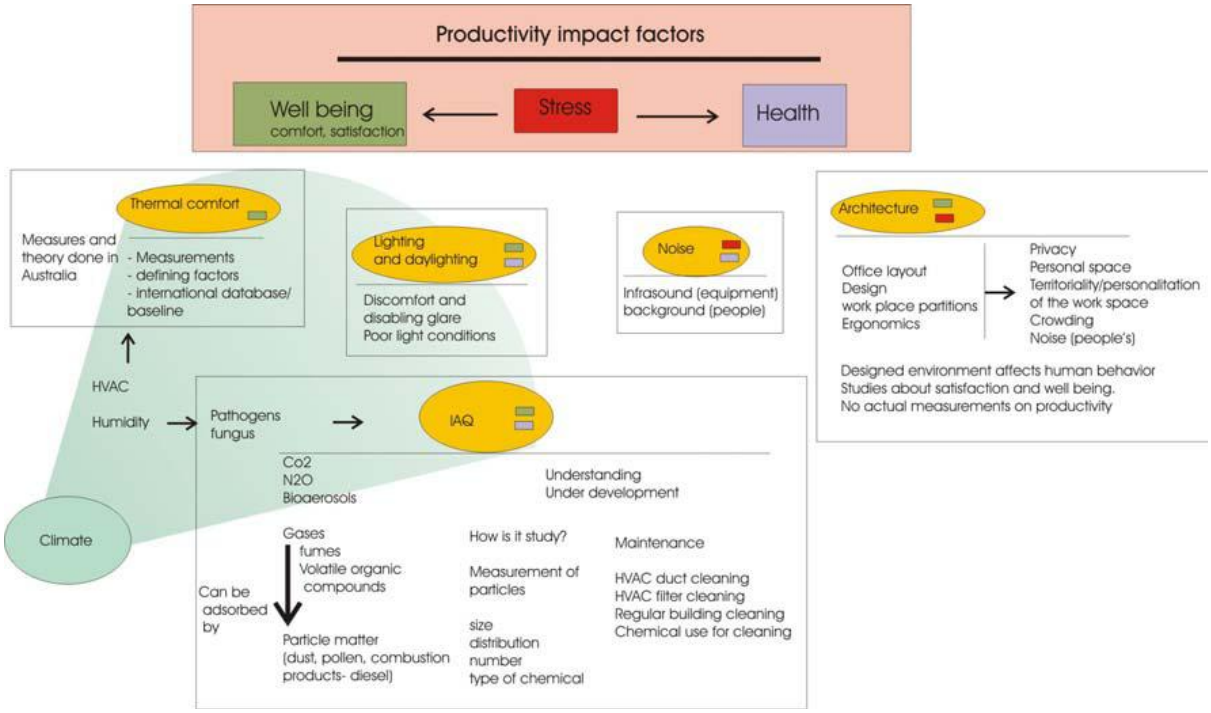
It is important to study actual work processes, noting how much time people spend in collaboration or interaction, and the formality or spontaneity with which they choose where and when to talk and how many people are engaged. Many collaborative areas are unused because the potential users do not perceive them in the same way as the designers (Oseland, 2009).

Space and its design can be seen to have major impacts on how people work – satisfying many of the basic and higher order human needs.

5.0 Office Environment Factors Impacting On Productivity

Much research has been carried out to identify the effects of indoor environments on worker performance. Bell et al. (2003) illustrate the key factors identified as impacting on productivity – see Figure 1. These factors are confirmed by an extensive array of research eg Roelofsen, 2002; Fisk 2000; Marquardt et al. 2005; Vischer, 2006; Vischer, 1996). The major findings are that whilst certain factors and improvements to indoor environments can beneficially impact productivity, what is essential is to avoid irritants and distressing features that cause discomfort (Clements-Croome, 2000; Davies, 1995) – indeed Leaman and Bordass (1999) identify areas such as thermal discomfort, distractions and poor indoor air quality as 'killer variables' since they correlate with discomfort and reduced productivity . In extreme cases, some buildings suffer from Sick Building Syndrome causing not just discomfort to occupants but actual physical distress and ill-health (Milton et al., 2000; Seppanen and Fisk, 2006; Seppanen et al.,1999).

Figure 1: Productivity impact factors (Bell et al. 2003, p.3)



These factors can be viewed as the basic comfort and survival needs of Maslow's Hierarchy of Needs or the 'hygiene factors' of Herzberg's two factor theory discussed above.

6.0 Conclusions

Workplace design needs to be based on actual work practices and satisfy a range of human needs to inspire the most productive and innovative work outcomes. Are there the looked-for increases in collaboration, creativity, or innovation leading resulting from these thoughtful new workplace practice designs? Most of the reports of increased productivity and improvements come from furniture design companies – which have their own agendas for reporting success. Results suggest improvements in areas such as decision-making (expedited); innovation (fostered); communications (enhanced); learning (encouraged); work-processes (improved); collaboration (enhanced); creativity (stimulated); and shared learning (CABE, 2005; Allsteel, 2006; Steelcase (nd(i)). The data come from occupant reported improvements and represent satisfaction scores rather than absolute measures. The research findings need some independent verification. But intuitively, providing spaces for collaboration and team working, that take into account both generational and evolutionary human needs seem likely to foster connectivity, friendships, and a shared sense of purpose. Trust building from successful teaming and sharing ideas and points of view is bound to encourage innovation and creativity.

Effective workplace interactions are proven to be fostered by understanding and using circulation patterns to facilitate spontaneous and informal communication, allowing visual connectivity. Strategic placement of informal common areas, located on favoured circulation routes, does encourage conversations and knowledge-sharing.

Dedicated teaming and collaboration space in combination with nearby individual work areas should be provided with mobile furniture, whiteboards, tackable surfaces, etc. that allow the retention of those cognitive artefacts that aid learning and creativity.

Spaces need to be on a human scale – large open plan areas need to be sub-divided to allow development of a sense of belonging to a community. Personalising space creates privacy, territory and safety, improving mood and job satisfaction. Work spaces also need to delight and inspire. Bland conformity will not assist creativity. Access to views and greenery will reduce stress and allow cognitive processing and recharge.

Additionally, ensure the 'hygiene' factors of a healthy, comfortable environment are provided that does not cause discomfort or introduce irritants to productive workers (such as distractions from overheard conversations because of too little acoustic privacy).

However, before assigning space or space layouts, it is important to establish what kind of work is going on. If there is no formalised project work, do not set up dedicated team rooms. If the majority of work requires concentrated solo working – provide the essential quiet spaces and comfortable commons areas for when the worker would like some informal conversation and relaxation.
By looking at work practices, providing the right kind of spaces for them, and appreciating the mix of human needs that need to be satisfied, future office spaces can be inspiring places to work.

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