



The impact of psychological needs on office design

Nigel Oseland

AMA Alexi Marmot Associates, London, UK

Abstract

Purpose – The purpose of this paper is to summarise the main psychological theories that have implications for the design and management of successful workplaces. This will support real estate professionals in advising occupiers on how to enhance the quality of their workplaces to improve the performance of its occupants.

Design/methodology/approach – The paper summarises relevant psychological research and offers guidance based on the literature review.

Findings – In general, current trends in building design and selection do not fully consider psychological factors. Whilst new buildings may be space efficient they are unlikely to be as effective as those buildings that do account for basic individual and organisational needs.

Originality/value – This paper provides a review of the psychological theories in the context of office design. A fuller understanding of such theories will improve the quality of workplaces.

Keywords Office layout, Workplace, Performance management, Personal needs, Psychology

Paper type Literature review

Introduction

Psychologists working within the building design industry are often asked why an estates director, building manager or architect would seek their skills and advice. Le Corbusier (1923) famously remarked that “the house is a machine for living in” and so it follows that offices are machines for working in. To create successful workplaces, we must therefore understand the requirements and behaviour of the occupying people and organisations; a task psychologists enjoy and excel at.

In the case of office buildings, the design is becoming more complex as it is confounded by the changing nature of work (from a service to knowledge to creative industry), new flexible workstyles, the more distributed and virtual workforce, globalisation and a merging of cultures. Therefore, more than ever, we need to understand how offices are used and how they can best support the people who use them.

The psychology literature, in particular the field of Environmental Psychology, is inundated with theories and studies which explore how people behave and perform in different environments, depending on their base human needs, personality, motivation, perception, expectation and experiences. This paper offers a review of the psychological literature and focuses on how to design and select offices which acknowledge the needs of the occupants, rather than simply focussing on designer intuition, fashion, peer opinion, iconic status, or aesthetic appeal.

Personality theories

In essence, Psychology is the scientific study of human behaviour and mental processes such as perception, cognition, emotion, motivation and personality.



Eysenck's (1967) classification of people as either introverts or extroverts is one of the most central personality theories. Basically, he describes introverts as those preferring to spend more time engaged in solitary activities perhaps focussing on a single task. Conversely, extroverts are more gregarious individuals who are content in social gatherings but can be easily distracted when working alone. This theory implies that not only are people with different personalities better suited to different work activities but also they will prefer to either work alone or amongst their co-workers. In reality, most people have personalities which are a mix of introvert and extrovert traits and the preferred environment depends on other factors such as the type of activity being conducted and mood.

Another core personality theory is that of Locus of Control, developed by Rotter (1966). Locus of Control refers to the perception of the underlying main causes of events and people are categorised as having an internal or external locus of control. An "external" believes that behaviour is guided mostly by outside influences such as fate or luck. In contrast, an "internal" believes behaviour is guided by his or her own personal decisions and behaviour. In the office, internals are more likely to be self-motivated so may need less supervision than externals. On the other hand, internals may be better suited to flexible working, where they can choose when and where they work. Conversely, externals may require more supervision and their workplaces should facilitate management by lines of sight by, for example, creating open-plan team areas.

A person's personality will undoubtedly influence the profession they chose. Creating work environments that reflect the occupants' personalities clearly presents a design challenge, but it is a challenge that until now has been mostly ignored.

Motivation theories

Like all disciplines, psychology has a set of meta-theories that underpin much of the opinions and practices of its professionals. A key fundamental theory is the Yerkes-Dodson Law (Yerkes and Dodson, 1908) which proposes an inverted U-shape relationship between a person's performance and their level of arousal i.e. excitement or interest. The theory states that people can perform better if they are stimulated or motivated (which increases their level of arousal), but there is a limit as too much stimulation can lead to stress and thus reduce performance. We might therefore assume that to maximise the performance of office workers we need to design stimulating but not too over-stimulating environments (Plate 1). Unfortunately, one complication is that individuals have a different base level of arousal and therefore need different magnitudes of stimulation for optimal performance. For example, extroverts have a low natural level of arousal and enjoy thrill-rides whereas introverts who have a higher level of arousal might find such rides distressing. Locus of control, age and gender also all affect level of arousal.

A further complication is that difficult and complex tasks (or working under time pressure) are in themselves demanding and therefore increase the level of arousal, thus people need subdued environments to maximise performance. In contrast, repetitive or menial tasks require more stimulating environments to increase the level of arousal. So, in simplistic terms, stimulating environments with vibrant colours, music or noise, and a buzz of activity may enhance the performance of extroverts or those conducting simple tasks, but more calming environments will better suit

Plate 1.
Create stimulating and
interesting work
environments



introverts or those involved in more complex tasks. Whereas it may be possible to create different environments for groups of people brought together to conduct similar tasks, it is more difficult to design for a mix of introverts and extroverts in the same team.

Early research into work environments, particularly industrial settings, has resulted in a series of motivation theories. The most renowned of these is the Hierarchy of Needs where Abraham Maslow proposed that people have five tiers of needs that have to be met in turn before they can fulfil their maximum potential (Maslow, 1943). In general the two lower order needs, Physiological and Safety, relate to the basic functions of buildings such as providing shelter, food, comfort and security. The middle Social need relates to a sense of belonging, i.e. team areas, and space for social interaction. The two higher order needs, Esteem and Self-actualisation, are more related to the organisational aspects of the workplace i.e. reward, autonomy, responsibility and prestige. One interpretation of Maslow is that if we do not provide comfortable environments that fulfil base human needs then, regardless of rewards, the building occupants are unlikely to be at their most productive.

Herzberg's Motivation-Hygiene Theory (or Two Factor Theory) derived from his own research builds upon the main themes of Maslow's theory. Herzberg *et al.* (1959) postulated that provision of organisational factors such as recognition, responsibility and achievement all motivate us to perform better. In contrast poor hygiene factors, or working conditions, can lead to dissatisfaction and therefore reduced performance.

Raisbeck (2003) conducted a study of the shared services function of a major UK bank as part of his MBA. Additional analysis of his staff questionnaire revealed three factors, termed hygiene, motivators and facilitators (Oseland and Bartlett, 2003). The motivators are similar to those found by Herzberg; hygiene factors are more related to environmental conditions such as temperature, daylight, noise and privacy; and the facilitators relate to the physical components of the office considered to support the motivation of the staff i.e. layout, support areas, interior design and branding. The conclusion is that if we do not provide workplaces that match base needs, such as temperature and noise, then it is unlikely that superficial changes, such as layout and colour, will enhance performance.

Repeatedly, post occupancy evaluations of offices reveal that the key causes of dissatisfaction are the hygiene factors, in particular temperature, ventilation, noise and privacy. The sceptics might quote the Hawthorne studies where it was shown that reducing the lighting levels had little impact on factory worker output. However, one explanation is that the participants of the Hawthorne study were motivated by the fact that someone was taking an interest in them, or more likely because the participants were studied in a room set aside where they sat amongst a small group of their friends. The social arrangement of the space was as important to them as the physical arrangement.

Much research has been conducted on the impact of noise on task performance, notably by Donald Broadbent (1958), with results in support of arousal theory. Others have focussed more on the paradox of open plan environments which allow more interaction but simultaneously cause more distraction through noise and interruption. Seminal research by DeMarco and Lister (1987) showed that it takes approximately 15 minutes to achieve a state of concentration, which they called “flow”, and any distraction means that another 15 minutes of emersion is required to achieve the same state of flow.

The design challenge is therefore to create workplaces which enhance interaction but minimise distraction. This is not simply a matter of providing high partitions or offices for everyone, as this reduces team interaction and line-of-sight management plus interferes with daylight and ventilation. The solution is as much to do with the management of the space as it is the design and acoustic properties, but a choice of different types of space is essential. Solutions can be categorised as:

- *Contain*. Contain the distraction by locating noisy teams together and away from the quieter teams; also co-locate team members as research shows people are more tolerant of noise from their own team than others;
- *Displace*. Displace the distraction by providing easy access to informal meeting areas, breakout and brainstorming rooms; conversely provide quiet areas for the staff to retreat to, including quiet booths, phone free desk areas or a library type space and the option to work from home;
- *Reduce*. Reduce the distraction by controlling the desk size and density; introduce some form of office etiquette which reinforces being mindful of disturbing colleagues (e.g. not holding impromptu meetings or leaving mobile phones unanswered); consider allowing headphones for those conducting repetitive tasks requiring concentration;

- *Avoid*. Avoid generating distraction, for example by providing speaker phones in open plan or meeting tables amidst workstations.

Environmental psychology

Environmental psychology is a relatively new field of psychology that explores the interrelationship between people and their physical settings; the main focus of this paper is the research related to office buildings. Traditional psychology took the view that behaviour is simply a deterministic response to the physical world, but Kurt Lewin (1943) proposed a different perspective, summed up by his equation $B = f(P, E)$, declaring that behaviour is a function of the person (P) as well as the environment (E). So individual experiences and different expectations of a space will affect how people interpret and interact with that space. Other environmental psychologists have built upon Lewin's work, for example Roger Barker (1968) introduced the notion of behavioural settings where the pre-conceived social etiquette associated with a particular setting unconsciously influences the behaviour in that setting, for example consider the behaviour of people in churches and libraries. Newman's defensible space theory has been used to decrease crime in residential areas by introducing symbolic barriers to represent boundaries (Newman, 1972). During his time at Surrey University, David Canter argued that it is a person's goals and intended actions in a space that influence their behaviour, such that people transact rather than simply interact with the space (Canter, 1977).

In terms of offices, the physical appearance of and assumed normal behaviour within a space (the behavioural setting) will affect its use; it is therefore not uncommon to see breakout spaces left unused when the associated acceptable behaviour is not understood. Furthermore, as occupants will have different goals, experiences and expectations of the same space, the way they interpret and respond to it psychologically will be quite different, even if they appear to be behaving in a similar manner. Designers should therefore be cognizant that what may be considered a good environment by one person (including themselves) may be perceived quite differently by another and vary according to what they intend to use the space for.

Much of the environmental psychology research has focused on aspects of space such as territoriality and privacy. A key contribution to the field is Hall's (1963) Proxemic Framework, where he estimated the preferred distances between people interacting with each other, which he termed: intimate, personal, social and public interpersonal space. His "social" distance includes business acquaintances and is estimated to be 1.2 to 2.1 m, but personality factors (such as introversion/extroversion and internal/external) and other personal factors (such as gender, age and culture) all affect the preferred interpersonal distance. In today's offices, it is not uncommon to see "touchdown" desks 1,400 mm wide and even 1,100 mm wide for use by itinerant workers. Such desks will not only be perceived as an intrusion of space and cause discomfort but may also generate more noise and distraction.

Osmond (1957) introduced the terms sociofugal and sociopetal space. Sociopetal space is that designed for social interaction, whereas sociofugal space discourages social interaction. Much of the research focuses on seating arrangements but the nomenclature could apply to circulation routes and environmental conditions etc. A simple application of this theory might be how a room is laid out for different types of

meetings. Breakout spaces that do not offer some level of privacy, drinks comfortable seating or a pleasant design may discourage interaction and be considered sociofugal.

Psychologists, such as Dan Stokols, make the distinction between high density and crowding. Density is the number of people per area whereas crowding is a subjective feeling of the amount of surrounding people, which is affected by personal, cultural and situational factors such as the activity being conducted (Stokols, 1972). So, a high density environment may not feel crowded for certain activities, e.g. a trading floor or call centre, but the same density may feel crowded for other activities. Research has also found that rooms with more daylight and lighter colours are perceived as less crowded and tasks requiring interaction are degraded in high density environments. One coping strategy for the infringement of space is for people to mark out their territory using physical and symbolic boundaries, e.g. cabinets, documents and personal artefacts such as family photos.

Irwin Altman brought all the theories of personal space, territoriality and crowding together into one unifying theory (Altman, 1975). Rather than regard privacy simply as a state of social withdrawal, Altman conceptualised privacy to be a dialectic and dynamic process for controlling the level of availability to others. By “dialectic” Altman means whether people are actually seeking or avoiding social interaction, and by “dynamics” he means that the desired level of interaction varies according to individual differences and circumstances over time. Altman proposed that not achieving the desired level of privacy will result in discomfort and stress with too little privacy leading to feelings of overcrowding and too much privacy creating social isolation. Furthermore, Altman suggests people try to use control mechanisms, or coping strategies, such as territoriality and personal space to control their level of privacy. The outcome of Altman’s model is that we need to provide building occupants with a means of controlling the required level of privacy depending on their personality and the task in hand. This is particularly difficult in open plan environments but can be overcome by offering a choice of work-settings and introducing office protocols to encourage particular behaviours in those settings. Spaces are required that restrict interaction, e.g. quiet pods, and spaces are required that encourage interaction, e.g. breakout, vending, nodes on circulation routes. Privacy is not controlled by physical factors alone but can be achieved through solitude, intimacy and anonymity, for example a busy café outside the office provides a low level of interaction and confidentiality. Ideally a set of spaces should be provided which can be readily adapted to meet the desired level of interaction.

Another classic psychological theory related to space is that of cognitive maps. Tolman (1948) described cognitive maps as the psychological transformations that code and recall information about the relative locations of everyday objects in space. This has particular relevance to wayfinding in complex buildings. People tend to use landmarks, boundaries/edges, nodes and colour to find their way around and these visual clues should be recreated in offices. These principles should also be adopted in the design of wayfinding maps, for example:

- the map should reflect the layout and appearance of the setting it represents;
- the labels used should represent actual labels (e.g. logos);
- the map should be aligned the same as the setting it represents; and
- there should be a clear “you are here” label.

Evolutionary psychology

Evolutionary psychology is one of the newest fields of psychology; although the term was first used in the mid seventies it was not widely recognised as a distinct subject until the early nineties (Cosmides and Tooby, 1987). Evolutionists believe that over time physiology develops, through natural selection, to ensure the survival of the species. Similarly, evolutionary psychologists argue that innate human behaviour is governed by adaptations of psychological processes which evolved to aid our survival and well-being.

Homo Sapiens evolved around 400,000 years ago in natural environments, but people have only worked in offices for around 100 years. As a consequence a person's psychological processes are probably more adapted to living on the African savannah than they are to working in offices. A key theme within evolutionary psychology is Biophilia, a term coined by Wilson (1984), which explains the tendency to be affiliated with life and the natural environment. Some evolutionary psychologists argue that people feel refreshed after sitting in a natural environment because nature provides a setting for "non-taxing involuntary attention" (Plates 2 and 3).

As a consequence evolutionary psychologists would argue that people seek places that support social gathering where they can share stories and food (hearth mentality), and in contrast seek private spaces to simply relax and restore. As social animals people also have a sense of community and equity, and desire a sense of belonging. Humans are also inquisitive animals that like to explore and forage, varying their sensory stimulation rather than remaining static. Sense of direction is based on natural clues such as the sun and landmarks, and people like to be able peruse what is around them and have a clear view of all directions. Our affinity with nature means that people like daylight, natural ventilation and a clear connection to the outside world and



Plate 2.
Provide spaces for solace
and contemplation



Plate 3.
Introduce nature into the
work environment

greenery. People also prefer noise to be at a similar level to that found in the natural world, with a slight buzz of activity.

The design implications for evolutionary psychology are self-explanatory, but nevertheless many offices would fail to meet these basic psychological needs. At minimum:

- provide a variety of spaces that allow people to gather, preferably with food and drink (“watering holes”) made available;
- offer a stimulating and interesting environment and allow us to move around and explore rather than stay working in one place;
- create places which offer quieter environments away from colleagues to concentrate or just contemplate;
- design facades which offer views out and good daylight ingress that will meet biophilia needs as will good landscaping externally and planting internally;
- ideally, provide natural ventilation and the control of internal temperatures, or failing that good fresh air ventilation and the option to work in locations of a different temperature;
- plan desks to offer views across the office and to the outside without the occupier feeling at risk of being overlooked from passers by, e.g. if located with their back to a main circulation route; and
- to satisfy egalitarian principles, ensure the workspaces on offer are made available to all.

Of course, people do not only adapt to their environments through long-term evolution but also through behavioural adaptations. Humans have physiologically evolved to adapt to different climates. However, Adaptive Comfort Theory recognises that people also adapt their behaviour, particularly clothing and activity, to match the thermal environment or where possible adapt the thermal environment to suit their requirements, for example opening a window using blinds, moving to a shaded area (Nicol and Humphreys, 1973). However, it is only recently that Adaptive Comfort Theory has been adopted in guidance for thermal comfort in buildings, before then guidance was based on thermoregulation and deterministic heat balance models where the body was considered to simply react to the thermal environment rather than interact with it. One outcome of Adaptive Comfort Theory is to allow occupants to adjust their clothing and therefore let temperatures drift higher in summer, rather than insist they wear a suit and the room temperature be kept at 22-24°C. As thermal comfort varies individually it also makes sense to provide zones in the offices with different temperatures and the option to choose where to work, including sheltered outside spaces or at home.

People are social animals but there may be an upper limit to the number of members within a social group that can be recognised. Robin Dunbar, a British anthropologist, discovered that the size of a social network is limited to around 150 members due to the cognitive capacity of human brain. He observed the size of social groups for a range of primates and found that the group size correlated with the size of their neocortex; he then used the size of the human neocortex to extrapolate the social network size for humans (Dunbar, 1993). The size of a typical African tribe, Neolithic farming village, Christmas card lists, the tactical unit for the Roman Legions (the manipule) and more recently the average number of Facebook “friends” are all approximately 150, thus verifying “Dunbar’s number”.

The key design consequence of Dunbar’s number is to keep office floor plates on a human scale. A current trend, particularly in London, is to create office buildings with large floor plates that accommodate some 400 to 600 staff sitting at rows of desks. Whilst this approach may be space efficient and support the co-location of departments, it could be overwhelming for the individual occupants who may be sitting amongst an expanse of people they do not know. In buildings with large floor plates consider creating business villages or communities, both physically and organisationally, which provide a sense of belonging and support spaces for teams. The large floor plates may also affect daylight ingress and not be conducive to natural ventilation and other (sustainable) passive cooling systems.

Summary

This paper has focussed on how to design office environments to meet basic psychological needs such as comfort, safety, security and sense of belonging. The premise is that if basic needs are not met then people can not perform to their maximum potential and in certain circumstances their health may be affected. Clearly the needs of the individual need to be balanced against the needs of the organisation, but it must be acknowledged that the key asset of most organisations is their people and if the people do not perform well then the organisation is unlikely to perform well. Design should focus on meeting the individual needs of the occupants and functional

needs of the organisation rather than on saving space or creating aesthetically pleasing but dysfunctional buildings.

The research described here has highlighted that different people require different environments at different times to perform well, depending upon the task they are conducting and personal factors. Designing for individual requirements is a challenge in a world of open plan office space, and key to the solution is providing a choice of work-settings to support different tasks and environmental preferences. As the nature of work changes, spaces are required that are catalysts for interaction, creativity and innovation, but spaces are also required for solitude, concentration and contemplation. The options for a “change of scenery” will also satisfy the urge to explore and a preference for a range of interesting sensory stimulation. Providing spaces that can be easily adapted or that people can easily adapt to will be preferred to fixed environments with no control over environmental conditions or layout.

Well designed (sociopetal) breakout spaces are required where people can socialise, celebrate and share food and drink without disturbing others. Not only will these spaces satisfy basic psychological needs but they could also enhance performance through serendipitous knowledge sharing and a wider understanding of the organisation worked for and its services. A good mix of quiet and social spaces, some of which are visible and others hidden, provides a degree of control over privacy. Enabling, and allowing, remote working offers the choice of working in “buzzy” café and social areas or seeking solace in quieter areas or at home.

The design of the office also needs to address the affinity with nature and be planned on a human scale with intuitive wayfinding. Shallow-plan buildings with good daylight, natural ventilation, a variety of greenery, and a sensibly sized floor plate at a comfortable occupational density are more likely to meet psychological needs than the current trend for building and occupying deep-plan, densely-occupied mega-floor plates.

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Further reading

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Corresponding author

Nigel Oseland can be contacted at: nigel@aleximarmot.com