Enhancing Creativity Through Workspace Design

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Creativity and innovation has been discussed in the context of differing spatial dimensions; national, regional; from the perspective of localised clusters of innovation within places, and at the dimension of face-to-face contact (physical co-proximity). Creativity within an organisational context can be greatly influenced by the characteristics of the physical environment in which each stage of the creativity process is undertaken, whether this is providing the personal, private space for individual contemplation or working with others for elaboration and evaluation (facilitating physical co-proximity). The design and layout of the space in which this work is undertaken can be a key enabler or constraint of creative working and therefore creativity itself. Rather oddly, in an increasingly micro-level focus on space in the creativity and innovation literature, the most micro-level dimension (office space) has not been thoroughly examined through a synthesis between the facilities management literature and the innovation and creativity literature. The most micro-level physical space or environment for knowledge work is most often in the form of an office that is furnished with desks, chairs (workstations) and meeting rooms. Though the design and the allocation of this space can vary across organisations, for the purpose of this chapter, this most fundamental definition of the physical space will be referred to as 'workspace'.

The Hawthorne experiments in the 1930s[1] were one of the first studies to identify the role of the workspace on creativity, innovation and work performance, and has since been studied in a range of fields including environmental psychology, ergonomics, architecture, sociology and human resource management. Organisations are increasingly regarding their workspace as a core element of their innovation strategy. For high tech companies, this is clearly evident when seeing images of the offices at Google or Facebook or watching the film *The Internship* to see the use they make of the physical environment to support creativity such as using chalet lifts for meeting spaces and providing bean bags and hammocks for individual work − using unusual design to stimulate creative thinking and dialogue.

Organisations also create and use spaces specifically designed for innovation known as 'Innovation Laboratories', defined by Lewis & Moultrie as "dedicated facilities for encouraging creative behaviours and supporting innovative projects"[2]. These began in the early 1980s, with the first being developed by the US company, MG Taylor with their Navigation Centres. These were collaborative workspaces designed to encourage organisational communication and learning through flexible environments with moveable furniture, write-on surfaces and multimedia tools for group working. More recently Innovation Laboratories have been used increasingly as a strategic response to challenges in the area of organisational capability development and learning (Oksanen and Stahle[3];

[1] Yoder, Dale, F. J. Roethlisberger, William J. Dickson, and Harold A. Wright. "Management and the Worker." Southern Economic Journal 6, no. 4 (April 1940)

[2] Lewis, Michael and James Moultrie. "The Organizational Innovation Laboratory." *Creativity and Innovation Management* 14, no. 1 (March 2005), 73

[3] Oksanen, Kaisa and Pirjo Ståhle. "Physical Environment as a Source for Innovation: Investigating the Attributes of Innovative Space." Journal of Knowledge Management 17, no. 6 (October 21, 2013)

Smeds[4]). But also used widely by government offices such as UK Department of Trade & Industry, MaRSSolutions Lab, Nesta and GovLab for improving understanding in areas of food, health, technology, work and learning and more general future centres; as well as those used in private sector companies in the areas of retail (e.g. Lowes), manufacturing, finance and consultancy firms (e.g. Deloitte).

For organisations that are not in the high-tech industry or constructing dedicated facilities for innovation, one of the greatest debates around creativity and innovation is how to design the office layout and in particular whether this should be 'open plan' or 'closed private' offices, or a dialectic combination of the two layouts. Open plan has been defined by Van der Voordt[5] as being workspaces that house 13 work stations; and cellular or shared offices as 3-12 workstations, making anything less than 3 classed as single, private offices.

Often the decision on the office layout is made by facilities managers and is largely influenced by making the most quantitatively 'efficient' use of the space. Open plan tends to win favour because of the tangible economic benefits such as higher occupant density, increased net usable area and the ease with which re-configuration can be made if necessary (Duffy and Powell[6]). There is so much more to the design of the workspace however than just space efficiency. The layout of the workspace also has a significant influence on the way that people use the space as well as being a signal of organisational culture, both of which have implications for creativity. Hence, there is a significant efficiency-effectiveness dichotomy in the design of the workspace that may often prejudice efficiency over effectiveness.

Within this chapter we will begin with an examination of the purpose of the office to bring people together to creatively interact (rather than merely be physically co-proximate), and how office designs have changed over recent decades. We then move on to consider the nature of today's knowledge workers which workspace is designed for, and examine their changing needs. We then move on to consider approaches that have been advanced about workspace design and individual creativity to support privacy and concentration as well as colour and lighting. We also discuss the issue of spatial fixity and fluidity by considering boundaries between spaces and the spanning of those boundaries by individual agents. Following this the ways in which collaboration can be supported through the workspace is then examined in terms of the location of individuals in the office and their proximity. Finally, consideration is given to the ways in which the balance between privacy and collaboration can be achieved through the workspace, in providing a range of working environments and encouraging movement through the office.

The development of offices

[4] Smeds, Riitta. "Organizational Learning and Innovation Through Tailored Simulation Games: Two Process Re-Engineering Case Studies." *Knowledge and Process Management* 4, no. 1 (March 1997)

[5] van der Voordt, Theo J. M. "Costs and Benefits of Flexible Workspaces: Work in Progress in The Netherlands." *Facilities* 22, no. 9/10 (July 2004)

[6] Duffy, Francis and Kenneth Powell. *The New Office: With 20 International Case Histories*. London: Octopus Publishing Group, 1997.

The development of the modern office emerged alongside the rise of industrial age due to the need for clerical factory work. Frank Lloyd Wright's 1903 Larkin Building is often cited as an archetype of this era (Sundstrom and Altman[7]), with workers seated in row after row and supervisors gazing down upon them from a panoptican (pan-optican) in order to maintain a high degree of control. Within this workspace the main aim of design was to ensure that the workers performed the tasks they were assigned in the most accurate and efficient manner, and locating the supervisor with a high degree of visibility was a design focus. The advancement of construction technology and an economic revival after the Second World War, enabled the construction of taller office buildings, bringing with it a more generous workspace. Demands from managers and supervisors for individual offices created the office as a symbol of status as those seen in Snow's[8] Corridors of Power. The size of the office and the furniture that it could accommodate symbolised managerial status, with the more senior managers having space not only for a sizeable desk, but also for a meeting table, coffee table and easy chairs. The influence on workspace design at this time was for bureaucratic and egotistical space. The rise of professionals in the post-war era, with the increase in commerce, also increased the demand for individual as opposed to shared offices. There was a need for functional space that allowed concentration and independence for these workers. Creativity and creative space was not even a consideration.

In the 1960s, the Burolandschaft or *landscaped* office, was introduced as an alternative to private or *cellular* office layouts. This incorporated an irregular arrangement of desks across an open plan space with displaced lines of furniture and promoted an increased openness and equality as well as a freer flow of information (Sundstrom and Altman[9]). The popularity of this layout spread across Europe and North America in the 1960s and 70s, supported by the design of flexible furniture (see Propst and the Action Office). However this office layout did not fit well with a traditional managerialist hierarchical culture, and with the rise of energy costs, the fashion returned to cellular offices (Price[10]). Not all of the old designs of cellular offices were embraced however, solid walls were frequently replaced with glass walls which allowed for auditory privacy, but maintained the visual connectivity such as that identified by Van der Voordt[11] in the development of the 'combi-office' in Scandinavia.

Manifestations of the combi-office design tend to dominate today's office environment, where there are private cellular offices (that are not always glazed) alongside open-plan working and are complemented with a range of informal and formal meeting spaces. The working practices that accompany the office layout design can be explicitly stated through the allocation of dedicated workspace, bookable meeting rooms, specified break times; or alternatively the design can give rise to an implicit understanding of what the workspace can be used for. In order for the right message to be com-

[7] Sundstrom, Eric. and Irwin Altman. "Physical Environments and Work-Group Effectiveness." *Research in organisational behaviour* 11 (1989)

[8] Snow, C P. *The Corridors of Power*. London, United Kingdom: House of Stratus, 2000.

[9] Ibid

[10] Price, Ilfryn. "Open Plan and Academe: Pre- and Post-Hoc Conversations." In Proceedings of the CIOB W70 conference, edited by E Finch. Edinburgh, 2008.

[11] van der Voordt, Theo J. M. "Costs and Benefits of Flexible Workspaces: Work in Progress in The Netherlands." *Facilities* 22, no. 9/10 (July 2004)

municated to occupants, organisations need to have a clear understanding about how they want their employees to work; whether they want a high degree of interaction, or more individual focused work; and which groups of employees do they want to interact. For instance, is there a value in inter-functional and inter-departmental interaction, or is the value of interaction only evident between cognitively proximate individuals, say within the same functional area. Are the day to day tasks of some workers, mostly bureaucratic rather than creative and therefore the design of their workspace as creative, value neutral or potentially even value destructive? The design of the workspace and the location of individuals/ teams within the space can play a key role in achieving the desired balance of interaction and privacy which are key components of the creativity process.

Designing workspace for knowledge workers

Many of those that occupy today's offices can be classified as 'knowledge workers', where there is a need for individuals to apply theoretical knowledge that involves learning as opposed to repeating formulae or scripts (Greene & Myerson[12]). This learning tends to be around solving complex problems such as coming up with new products or services, addressing supply chain issues or streamlining production − and so key to this is the generation and realization of ideas (Hennessey & Amabile[13]; Wuchty, Jones & Uzzi[14]). The process of creativity is now widely accepted to be a combination of individual concentration and intuition, and collaboration with others (Amabile et al.[15]; Boden[16]; Csikzentmihalyi[17]). Workers need time on their own to prepare and define their ideas, research the plausibility of ideas and elaborate their thoughts, but they also need time with others to discover ideas, validate them and evaluate their original thoughts. All of this takes place through a non-linear, reiterative and messy progression (Amabile et al.[18]; Haner[19]; Van der Ven et al.[20]) and so to support this, the workspace and its accepted use should encourage free-flowing movement and flexibility.

However, not all knowledge workers are the same in the work that they undertake and so it is not appropriate to adopt a generic approach to the design of the workspace to support individual and collaborative work. Greene and Myerson[21] identified four 'character types' of knowledge workers based on their degree of mobility in, around and outside of the office environment. The first type of knowledge worker is the *Anchor* who is the typical sedentary office worker, that can be found relia-

[12] Greene, Catherine and Jeremy Myerson. "Space for Thought: Designing for Knowledge Workers." Edited by Barry P. Haynes. *Facilities* 29, no. 1/2 (February 2011)
[13] Hennessey, Beth A. and Teresa M. Amabile. "Creativity." *Annual Review of Psychology* 61, no. 1 (January 2010)
[14] Wuchty, Stefan, Benjamin F. Jones, and Brian Uzzi. "The Increasing Dominance of Teams in Production of Knowledge." *Science* 316, no. 5827 (May 18, 2007)
[15] Amabile, Teresa M., Regina Conti, Heather Coon, Jeffrey Lazenby, and Michael Herron. "Assessing the work environment for creativity." *Academy of Management Journal,* 39, no. 5 (October 1, 1996)
[16] Boden, Margaret A. *The Creative Mind: Myths and Mechanisms*. London: Sphere Books, 1992.
[17] Csikszentmihalyi, Mihaly. *Creativity Flow and the Psychology of Discovery and Invention*. New York: HarperCollins Publishers, 2007.
[18] Ibid.
[19] Haner, Udo-Ernst. "Spaces for Creativity and Innovation in Two Established Organizations." *Creativity and Innovation Management* 14, no. 3 (September 2005)
[20] Ibid.
[21] Ibid.

bly at their desk in the office on a daily basis. Most of their tasks are desk-based and movement around the office is minimal (apart use of functional spaces such as meeting rooms or kitchens). Due to their inevitable physical co-presence, they can be considered to be a hub in the office environment and are a key source of information, though they like to organise their day with set times for formal and informal collaboration, individual work and social activity. The second type of knowledge worker is the *Connector* who spends half of their time at their desk and the other half around the office building: at colleagues' desks, in meeting rooms or in informal meeting spaces such as kitchens or cafes. Their interaction is largely internally focused, depending on contact with people from different departments across the organisation. They have a need to be able to take their work with them when collaborating with others, using technology to support this. This character (agent) type performs a boundary spanning role between different functions.

It is pertinent here to briefly mention the role of boundaries when we move from a discussion of *workspace* to the plural, *workspaces*. Hsiao, Tsai and Lee suggest that:

> "A 'boundary' is a demarcation, or a sphere of activities, that marks the limits of an area, which may include knowledge, tasks, as well as hierarchical, physical, geographical, social, cognitive, relational, cultural, temporal/spatial, divisional, occupational, and disciplinary boundaries."[22]

We can also speak of the boundary spanning actor as an agent in space and time. One utopian perspective would be that all levels of an organisation interact with all others all the time - known as a multi-level collective bridge (Zhao & Anand[23]). However, utilising boundary agents are a more utilitarian way of identifying which aspects of knowledge needs combining, and indeed which knowledgeable agents need to interact to further creativity. A connector largely fills this role internally between functions, mitigating the need for more complex and eclectic knowledge sharing exercises.

A third element in the taxonomy is the *Gatherer* who may span boundaries between organizations as well as within. They bring knowledge, information and connections back to the office during their working week. Around half of their week is spent at clients' offices, or other neutral locations, travelling regionally, and the other half of their week is spent in the office. In this sense, the Gatherer must make an optimal judgment of what length of time to spend in different spaces in order to further creativity. For this type of knowledge worker, the office is a place where they can distil and disseminate the information, business and new relationships that they have gathered. In these sense, the office is their recipient space. They need space that will allow them to concentrate on processing and reviewing information, but also allow them to collaborate with relevant colleagues inside their recipient space. Their requirements are only for half of the week, so they are often not provided with a specific desk of their own instead they work on a shared-desk or hot-desk.

The final type of knowledge worker is the *Navigator* who relies mainly on relationships away from

[22] Hsiao, Ruey-Lin, Dun-Hou Tsai, and Ching-Fang Lee. "Collaborative Knowing: The Adaptive Nature of Cross-Boundary Spanning." *Journal of Management Studies* 49, no. 3 (June 29, 2011) 463.
[23] Zhao, Zheng J. and Jaideep Anand. "Beyond boundary spanners: The 'collective bridge' as an efficient interunit structure for transferring collective knowledge. *Strategic Management Journal,* (April 4 2013)

the office, working for the organisation at arm's length, such as a contractor, consultant or nomad salesperson. They come into the office on a few occasions throughout the month for meetings, and require a desk where they can set up their laptop and begin working immediately. During their day in the office they need to be allowed to concentrate, but also collaborate with others to disseminate the progress that they are making. Most importantly, they need to be made to feel part of the organisation given the ideas and external knowledge that they can bring is so valuable and undertaken in a relatively short space of time. The Navigators have significant knowledge of external conditions, but if not properly integrated into the workspace, their knowledge can remain privately embedded and not disseminated within the organisation. The design of the workspace to maximise their interaction, potentially serendipitous interaction while physically co-proximate, is a key design consideration.

Each of these types of knowledge workers have different requirements from the workspace, not only in terms of dedicated desk space and ergonomically designed furniture, but space where they can concentrate as well as space to collaborate. They must also consider which other spaces they must interact and boundaries they must cross. This research demonstrates the need for the office environment to offer more choice to occupants in terms of the tools and spaces that are available and the power to be able to use them as and when needed.

Achieving the right balance from the physical space for concentration and collaboration for the different types of knowledge workers, offering that choice and variety, as well as nurturing the desired implicit understanding of how to use the workspace, can be a complex process for organisations. We will now look at some of the key workspace variables that have been suggested to influence individual, intra-personal creativity and those for collaborative, inter-personal creativity and then consider how to strike the right balance for the complexity that is the creative process.

Workspace and individual creativity

There are periods within the development of ideas where individuals need to be alone with their creativity for private thought and contemplation, such as thinking through their idea, undertaking background research, or for developing the idea for validation. The workspace in which this takes place can support and enhance this stage of creativity, from the colours that are used, accessibility to natural light, as well as the levels of privacy that are offered both visual and auditory. In the design of a service environment, Slåtten et al.[24] have suggested three components to design: first, ambience (sound, light and scent); second, the flow of interaction within the space; and third, the physical design of the tangible elements within the space. We propose that these factors are equally pertinent to workspace design. The use of specific colours in wall decoration have been examined in experimental studies for their influence on the creativity of workers undertaking specific creative task performance. Ceylan et al.[25] found that calming colours (e.g. green, blue or blue violet) provided

[24] Slåtten, Terje, Mehmet Mehmetoglu, Göran Svensson, and Sander Sværi. "Atmospheric Experiences That Emotionally Touch Customers." *Managing Service Quality: An International Journal* 19, no. 6 (November 13, 2009)

[25] Ceylan, Canan, Jan Dul, and Serpil Aytac. "Can the Office Environment Stimulate a Manager's Creativity?" *Human Factors and Ergonomics in Manufacturing* 18, no. 6 (November 2008)

a relaxing experience which was valuable for creativity; and McCoy and Evans[26] found more vibrant colours (e.g. yellow, pink, red or orange) to be sources of inspiration. Access to natural light has also been considered as an influential factor on the creativity process, in terms of the benefits of sunlight entering into the work environment (Ceylan et al.[27]); the quantity of light that individuals are exposed to (Knez[28]); and the value of having visual access to natural environments (e.g. trees, plants) from the work environment (McCoy and Evans[29]; Stone and Irvine[30]).

Privacy in the work environment is also an important element that influences intra-personal creativity. Visual privacy can not only provide the worker with a reduced level of distraction which will enhance concentration, but it also reduces the likelihood of being interrupted by others who are not aware of their presence. Visual privacy can be provided in the work environment through walls that create a cellular office, or partitions of varying heights that can be attached to desks. A number of studies have been undertaken that support the perception that partitions create a sense of privacy and are positively related to environmental satisfaction that is beneficial to creativity (Desor[31], Sundstrom and Altman[32]). Greene and Myerson[33] also discussed the benefits of permeable boundaries such as curtains or screens that can be moved and adjusted to provide privacy and quiet as well. The physical boundaries not only create the visual privacy, but also the auditory privacy, that allows individuals to concentrate on their own thoughts or have private conversations.

The interpersonal distance between individual workers and the proximity of workstations to others is a further area of study in understanding the influence of the physical environment on creativity. A study of the face-to-face communication patterns of research engineers undertaken by Allen[34] and Allen and Henn[35] are frequently cited examples − concluding that knowledge workers are most likely to interact with colleagues in their immediate vicinity, with this interaction declining rapidly after 30 meters. To increase the likelihood of face-to-face communication and collaboration therefore, workers should be located in relatively close proximity. They also found that communication was influenced by 'perceived' distance, so if workers are separated by a staircase or corridor space but are still less than 30 meters apart, then their likelihood for communication is reduced. Therefore, in designing workspaces for individual concentration, perceived distance should be considered with the inclusion of corridors, which still then allows for the most efficient use of space.

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[26] McCoy, Janetta Mitchell and Gary W. Evans. "The Potential Role of the Physical Environment in Fostering Creativity." *Creativity Research Journal* 14, no. 3-4 (October 2002)

[27] Ibid

[28] Knez, Igor. "Effects of Indoor Lighting on Mood and Cognition." Journal of Environmental Psychology 15, no. 1 (March 1995)

[29] Ibid.

[30] Stone, Nancy J. and Joanne M. Irvine. "Direct or Indirect Window Access, Task Type, and Performance." *Journal of Environmental Psychology* 14, no. 1 (March 1994)

[31] Desor, J. A. "Toward a Psychological Theory of Crowding." *Journal of Personality and Social Psychology* 21, no. 1 (1972)

[32] Ibid

[33] Ibid

[34] Allen, Thomas. J. *Managing the Flow of Technology: Technology Transfer and the Dissemination of Technological Information with the R&D Organisation*. Cambridge, MA: MIT Press, 1984.

[35] Allen, Thomas J. and Gunter Henn. *The Organization and Architecture of Innovation: Managing the Flow of Technology*. Amsterdam: Butterworth-Heinemann, Amsterdam, 2006.

So far we have considered the individual being located on their own, in a private, quiet, naturally-lit room (or partitioned area) located remotely from other workstations. An alternative perspective to this approach is Social Interference Theory, introduced by Evans, Johansson and Carrere[36] that suggests that the more 'dense' an environment, the lower the chance of collaboration. This is because the more noise that there is in an environment, the greater the ability of individuals to block this out and concentrate harder on the task at hand. Adopting this viewpoint would mean that workstations are best being located in close proximity to allow for individuals to concentrate, and the need for individual private spaces is unnecessary.

Workspace and collaborative creativity

Creativity also requires individuals to collaborate with others, to spark ideas, sound out thoughts and discuss the implementation of ideas as innovations. The value of workspace for supporting and stimulating the collaboration of workers has been widely accepted (Becker[37]; Duffy & Powell[38], Laing[39]). Most of the research in the field of creativity and the physical workspace considers the office layout and the extent to which it can facilitate interaction either across the workstation to others in close proximity or to encourage movement across the floor space.

Interpersonal communication is core to collaborative creativity, and a study undertaken by Boutellier et al.[40] found that office layout influenced the frequency, duration and interval of this vital creativity component. Boutellier and colleagues studied the interactions of managers who undertook broadly similar work activities within the same organisational culture in an R&D firm, but different office layouts formed the basis on this investigation. One group occupied individual cellular offices with access to an open informal shared space, and the other group occupied an allocated workstation in an open plan layout with access to meeting and support spaces. They found that managers occupying the open plan layout communicated three times more often than those in the private offices, and this communication tended to be for shorter periods of time (three minutes on average, compared to nine minutes by the other managers). They also found that these managers went for longer periods of time without any communication, compared to those in the private offices. This would suggest that being in an open plan work setting not only encourages communication that is relatively concise, but it also enables occupants to undertake concentrated work when communication is limited.

Locating individuals in the groups in which they work will enhance the opportunity for communication due to their proximity. They can over-hear colleagues' conversations which they can help with

[36] Evans, G. W., G. Johansson, and S. Carrere. "Psychosocial Factors and the Physical Environment: Inter-Relations in the Workplace." 1994

[37] Becker, Franklin D. *Offices at Work: Uncommon Workspace Strategies That Add Value and Improve Performance*. San Francisco, CA: John Wiley & Sons, 2004.

[38] Ibid

[39] Laing, Andrew. "New Patterns of Work: The Design of the Office." 2006

[40] Boutellier, Roman, Fredrik Ullman, Jürg Schreiber, and Reto Naef. "Impact of Office Layout on Communication in a Science-Driven Business." *R&D Management* 38, no. 4 (September 2008)

or could serendipitously spark ideas and thoughts. Indeed it is possible to speak of planned serendipity as a design idea (Eagle[41]). Appel-Meulenbroek[42] found that physical 'co-presence' was the most important factor on knowledge sharing since people in close proximity tend to interact more and it is easier to provide 'unquestioned' help. This can be beneficial, but can also establish a degree of territoriality, where workers feel that they 'own' the tangible aspects of specific location (e.g. desks, chairs, printers, kitchen facilities) as well as the intangible elements (e.g. an idea, conversation). Sundstrom and Altman[43] identified the notion of 'boundary territoriality' where the physical environment occupied by a group governs the way that the group works, the flow of information and resources into the group as well as out. Demarcating the group in this way leads to the sense of protecting the group members and the work that they produce, which establishes strong support for the ideas that are produced.

However, this can give a somewhat blinkered view, given that there is little outside stimulation offering different perspectives which are a key element of creativity and the development of innovations. This approach is akin to Granovetter's theory[44] on the strength of weak ties. When there are strong connections between a small number of individuals they begin to think in the same way and the development of novel ideas becomes limited. It is much better for creativity and innovation for less frequent and weaker connections to be made with a larger number of individuals, since there is access to a much greater number of perspectives, resources and stimulations. The boundary spanning role (i.e. the Gatherer or the Connector) is a key element in bridging structural holes between spaces (Burt[45]) or alternatively to generate relationships outside of the group, it could mean re-locating individuals on a timely basis, locating individuals with people that they don't directly work with or encouraging movement away from the group.

Hua et al.[46] undertook a study with 308 occupants of 27 different workplaces in the US to explore the relationship between the spatial characteristics of the workspace and the perceived support they offered for collaborations between the occupants. They considered the size of the individual workstation, the level of enclosure (based on the height of the desk partitions), the interpersonal distance between the co-workers, the density of the workspace (number of workers within 25 feet) and whether the workstation had a door (open cubicle or closed office). They also considered the distance from each workstation to the nearest shared spaces such as meeting spaces (formal and informal), printing/copy areas and kitchen areas. Analysis of the self-assessment questionnaires provided about the collaborative nature of the workspace showed that meeting rooms and workstations were best located in close proximity in order for the shared spaces to be perceived as supporting collaboration, though these rooms require 'good acoustic isolation to prevent them from

[41] Eagle, Nathan. "Can serendipity be planned?" *Sloan Management Review,* 46, no. 1 (2004): 10-14

[42] Appel-Meulenbroek, Rianne. "Knowledge Sharing Through Co-presence: Added Value of Facilities." Edited by Goksenin Inalhan. *Facilities* 28, no. 3/4 (March 2, 2010)

[43] Ibid

[44] Granovetter, Mark. "The Strength of Weak Ties: A Network Theory Revisited." *Sociological Theory* 1 (1983)

[45] Burt, Ronald S. "Structural Holes: The Social Structure of Competition." Cambridge, MA: Harvard University Press, 1992

[46] Hua, Y., V. Loftness, J. H. Heerwagen, and K. M. Powell. "Relationship Between Workplace Spatial Settings and Occupant-Perceived Support for Collaboration." *Environment and Behaviour* 43, no. 6 (October 19, 2010)

becoming distraction sources'[47]. Meeting rooms were found to be best located either at the corners of the floor space or at the centre to create the shortest distance. They found that printing/copy facilities were most effective for supporting perceived collaboration when located as a 'service hub' rather than being scattered across the floor space, which were instead considered to be more of a distraction. With regard to the kitchen/coffee areas, they could be located at a greater distance from the workstations and still be perceived to support collaboration and were not considered to be a source of distraction as was the case for the printing/copy facilities. This study shows the value of movement in the design of the workspace and using facilities as a means to encourage informal interaction and chance conversations between colleagues, but to also re-locate noise-distracting activities away from workstations where concentration is required.

Hillier and Hanson[48] developed the methodology of Space Syntax Analysis (SSA) as a means to understand the physical spaces that can enhance or inhibit social interaction, based upon a number of spatial elements. One of the elements included in this analysis is the visual connectivity of the space which identifies the spaces that are easiest to find and so are the space where social interaction is most likely to take place. Open plan workspaces that have limited physical barriers have a high level of visual connectivity, in comparison to cellular offices that have an abundance of physical, visual blockers. The application of SSA to a workspace floor plan can highlight areas which are 'hot spots' for visual connectivity, and the design of the workspace should capitalise on the opportunities that they create for social interaction. This can be done through the location of a 'service hub' to encourage collaboration or serendipitous interaction, or the location of key boundary spanning actors that would benefit most from the social interaction (see Suckley & Dobson[49]; Wineman et al.[50]).

Striking the balance

Traditionally, workspaces have focused on one particular layout (e.g. cellular offices or open plan) with a 'one-size-fits-all' approach. This has been primarily driven by the need to make the best or most efficient use of the space, uniformity to demonstrate equality, or even a lack of imagination. Any variations have tended to be where the workstation has been used as a symbol of status, based on the size of the office and the quality or size of the furniture provided. It is now increasingly recognised that this approach does not work as people have different working styles, either because of their personal preferences or because of the nature of their work. Because of these differences, their requirements from the workspace are also different, as shown in the 4 typologies of knowledge workers (Greene and Myerson[51]). Instead work environments need to offer a range of options, providing spaces for both individual work to allow for concentration and privacy, as well as spaces

[47] Ibid, 820.

[48] Hillier, Bill and Julienne Hanson. *The Social Logic of Space*. Cambridge: Cambridge University Press, 1984.

[49] Suckley, Louise and Stephen Dobson. "Measuring social and spatial relations in an office move." Lecture Notes in Computer Science 8851 (1 November 2014)

[50] Wineman, Jean, Yongha Hwang, Felichism Kabo, Jason Owen-Smith, and Gerald F Davis. "Spatial Layout, Social Structure, and Innovation in Organizations." *Environment and Planning B: Planning and Design* 41, no. 6 (December 2014)

[51] Ibid.

for collaboration.

Workspaces should include spaces that allow individuals to undertake tasks that require focus and privacy at their own desks through the use of physical barriers such as partitions, planting or glass walls to reduce visibility in order to minimise opportunities for interruptions or distractions. When there is a need to collaborate, there should be meeting spaces that can be booked for planned meetings, but also spaces for informal meetings that are unplanned.

Parkin et al.[52] researched the effectiveness of two layouts of academic workspaces that were designed to balance the need for collaboration and concentration. In the first layout, academics were allocated a desk in an open/ shared office, but they also had other spaces available to them around the workspace such as individual cellular offices for use when more private, concentrated work was being undertaken; 'small pods' for use in noise generating activities such as phone calls; as well as meeting rooms and a kitchen. In the second layout, occupants were allocated desks in individual offices that opened out onto an open space that included a range of breakout areas, kitchen facilities, print/ photocopier 'hubs', additional storage and a meeting room with access provided to additional shared/ social workspaces. The views of the occupants of the two office layouts starkly contrasted in terms of the space and noise levels, privacy, visual disruption and the accessibility of the spaces. Those in the first layout, with their 'default' location being in the open/ shared office, were much less satisfied with their workspace to undertake concentrated and creative work than those with the 'default' individual office. Although alternative spaces were available for them to use, they tended not to take their concentrated work to the supplementary spaces because of the perceived inconvenience and how this relocation might be viewed by their colleagues. This result suggests that it is important to not only provide the required range of workspaces, but also to develop a culture that embraces the flexibility that they offer.

One way to do this is to design the physical workspace in a way as to encourage movement in workers, whether this is people moving from their individual offices or from an allocated desk in an open/shared office. Movement has been linked extensively with creativity (Gondola and Tuckman[53]; Netz et al.[54]; Oppezzo and Schwartz[55]) not only in the physiological impact that it has on blood levels and chemicals changes, but also with regard to mood enhancement and the diversity in the surroundings that are encountered during this movement (Bar[56]; Rethorst, Wipfil & Landers[57]). Oppezzo

[52] Parkin, Jennifer K., Simon A. Austin, James A. Pinder, Thom S. Baguley, and Simon N. Allenby. "Balancing Collaboration and Privacy in Academic Workspaces." Edited by Barry P. Haynes. *Facilities* 29, no. 1/2 (February 2011)
[53] Gondola, Joan C. and Bruce W. Tuckman. "Effects of a systematic program of exercise on selected measures of creativity." *Perceptual and Motor Skills* 60, no. 1 (February 1985)
[54] Netz, Y., R. Tomer, S. Axelrad, E. Argov, and O. Inbar. "The Effect of a Single Aerobic Training Session on Cognitive Flexibility in Late Middle-Aged Adults." *International Journal of Sports Medicine* 28, no. 1 (January 2007)
[55] Oppezzo, Marily and Daniel L. Schwartz. "Give Your Ideas Some Legs: The Positive Effect of Walking on Creative Thinking." *Journal of Experimental Psychology: Learning, Memory, and Cognition* 40, no. 4 (2014)
[56] Bar, Moshe. "A Cognitive Neuroscience Hypothesis of Mood and Depression." *Trends in Cognitive Sciences* 13, no. 11 (November 2009)
[57] Rethorst, Chad D., Bradley M. Wipfli, and Daniel M. Landers. "The Antidepressive Effects of Exercise." *Sports Medicine* 39, no. 6 (2009)

and Schwartz[58] undertook a series of experiments to measure the effect of movement on creativity using the Guildford's Alternative Uses test[59] to measure divergent thinking and the Compound Remote Association test (Bowden and Jung-Beeman[60]) to test for convergent thinking. Participants were either asked to sit or walk at a self-selected rate, with this movement performed on either a treadmill, around an indoor or around an outdoor environment. They found that those participants that undertook some form of movement were substantially more creative in their thinking than those that stayed seated. The ideas that were formed during the experiments where the participants were moving were much more free-flowing and novel, than those that were seated. Whether this is due to the physiological effects of activity or the external environmental stimulations, both were beneficial. Given that this is a relatively easy-to-implement strategy, movement should be encouraged in the workplace.

Peponis et al.[61] outlines two different models of workspace design that enable communication between workers and the exchange of information. Using the 'flow model' the workspace is most effectively designed around the flow of information and locating individuals that are required to communicate in close proximity. This model is supported by the work outlined above by Allen[62] around perceived distance at which face to face communication declines. However, this approach does not account for individuals that regularly work with a wide range of different colleagues who cannot all be located in close proximity. The alternative model proposed by Peponis et al. is the 'serendipitous model' in which the workspace is designed to facilitate chance interactions between different workers and informal interaction. The provision of communal activity zones such as kitchens or print facilities and communal eating spaces are used in the 'serendipitous model' to facilitate the opportunity for chance interactions. These zones can be considered to be similar to the notion of 'actants' introduced by Latour[63] to describe inanimate objects that have the power to play an intermediary role in interaction. Based on his experience of town planning in New York, Gladwell[64] took a view on what can be considered to be 'actants' in the form of communal areas, such as parks or laundries in a shared building. He suggested that such places should be placed in the most central location so they can draw from the most disparate parts.

Research undertaken by Dobson and Suckley[65] explored the effectiveness of having such a centrally located kitchen area on the levels of interaction within a case study organisation. They found that although the 'hub' kitchen had been designed to facilitate the interaction of the teams that sur-

[58] Ibid.
[59] Guildford, J. P. *Alternative Uses. Form A.* Beverley Hills, CA: Sheridan Supply, 1960.
[60] Bowden, Edward M. and Mark Jung-Beeman. "Normative Data for 144 Compound Remote Associate Problems." *Behaviour Research Methods, Instruments, & Computers* 35, no. 4 (November 2003)
[61] Peponis, John. Sonit Bafna, Ritu Bajaj, Joyce Bromberg, Christine Congdon, Mahbub Rashid, Susan Warmels, Yan Zhang, and Craig Zimring. "Designing Space to Support Knowledge Work." *Environment and Behaviour* 39, no. 6 (July 10, 2007)
[62] Ibid
[63] Latour, Bruno. *Reassembling the Social: An Introduction to Actor-Network-Theory*. Oxford: Oxford University Press, 2005.
[64] Gladwell, Malcolm. "Designs for Working." *The New Yorker*, December 11, 2000.
[65] Dobson, Stephen and Louise Suckley. "'A squash and a squeeze': Managing Spatial Relations in the Office." *International Journal of Business Environment* 7, no. 2 (2015)

rounded the space, and it did draw many of the social actors together on occasions, it largely acted as a visual and auditory barrier that divided the organisation due to the relative size of the workspace. The kitchen was in fact too big for the space. Using SSA (Hillier and Hanson[66]), Dobson and Suckley calculated that the kitchen would have been more effective as an actant, had the office space been twice the size. Shared spaces therefore can be an effective source for drawing a wide range of people together to meet and interact, but their success as such communal focal points relies on a number of key parameters including their location and their size. Fayard and Weeks[67] examined this further in their development of the concept of the 'water-cooler' effect, identifying five key influences on the success of an actant:

- Accessibility: The space must be easily accessible and be located where signs of occupancy can clearly be visually assessed, so that availability is easily known.

- Proximity: Spaces are more likely to be used if they are close by to the workspace occupants so having a range of communal focal points throughout the workspace will meet the need for proximity.

- Privacy: There should be a sense of perceived visual and auditory privacy for both informal and formal meeting spaces to be successful, to allow workers to control the boundaries of their conversation.

- Legitimacy: Workers must feel there is a valid reason for being in the space where informal interaction could take place, or that it is generally socially accepted within the organisation to interact in the space.

- Functionality: The quality of the equipment provided, furniture style and layout as well as services and environmental conditions (air quality, temperature control, light) all influence the success of the meeting space.

All of these elements therefore need to be considered for the actants to have the desired effect of drawing people together to interact formally, informally, planned and unplanned.

A final element to consider around encouraging movement through workspace design was introduced by Knight and Baer[68] who have explored the effect of non-sedentary workspace on group performance in knowledge-related tasks. Work configurations that encourage standing rather than sitting are suggested to have not only a positive physiological effect on health by promoting increased activity movement levels, but also promote affiliation through collective sense-making as well as decrease group territoriality and feelings of possessiveness of an object i.e. a desk, chair, work-

[66] Ibid
[67] Fayard, Anne-Laure and John Weeks. "Photocopiers and Water-Coolers: The Affordances of Informal Interaction." *Organization Studies* 28, no. 5 (May 1, 2007)
[68] Knight, Andrew P. and Markus Baer. "Get Up, Stand up: The Effects of a Non-Sedentary Workspace on Information Elaboration and Group Performance." *Social Psychological and Personality Science* 5, no. 8 (June 12, 2014)

station. In their study on undergraduates, Knight and Baer found an increased level of group arousal when performing a creative group task in a room without seating, as well as a lower level of idea territoriality, than those in a room with seating. They conclude that the physical space did not determine the group performance, but rather by altering the space, it changes how people choose to interact with one another. Encouraging movement around the workspace to use formal and informal shared spaces as well as facilitate movement once the destination is reached, is supportive of the development of new ideas, and has interesting implications for workspace design.

Conclusion

As shown throughout this chapter there are many elements to consider when using the physical office environment as a facilitator for creativity, which makes getting this right a most complex task. At the beginning of their consideration of the physical workspace, organisations should be clear about the purpose of the work environment with regard to the corporate image that it portrays, the people that they want to bring together and the outputs that they expect to achieve. Following this the nature of the occupant, their role and preferred way of working needs to be taken into consideration as well as the knowledge that they bring to the organisation and how this can be shared to best effect. The work environment should then be designed to provide a range of workspaces to support concentration, collaboration, inspiration and dissemination.

Spaces for concentration need to be free from distraction, using colours, lighting, partitions and furniture that support the development of ideas and access to the information and facilities required. For collaborative working, spaces for both formal and informal meetings should be provided that have different degrees of auditory and visible privacy, and are easily accessible for planned and unplanned meetings. The design of shared spaces, such as kitchens, printers, water-coolers and photocopiers, also requires careful consideration in their location, size and accessibility in order for them to have the desired effect as an ‘actant’.

Alongside the design of the physical space, consideration also needs to be given to the location of employees within the workspace, particularly with regard to whether individuals should be co-proximate to their teams or mixed together, or if located together which teams should be located next to each other, as well as where they should be located in relation to the shared spaces, concentrated spaces and collaborative spaces. The issue of boundaries and boundary spanning and important design characteristics here.

Accompanying all of the physical design elements are also the development of a supportive culture for employees to use the space as intended. Where employees are encouraged to work from an office if they require concentration or privacy, without offending those around them; or being encouraged to walk to another team to have a conversation rather than making an internal phone call; and not be frowned upon to spend time in the kitchen talking to members’ of another team. Getting the balance between the physical space and cultural support right, will make a significant contribution to the facilitation of new ideas within an organisation to help them achieve their innovative potential.

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