

SPACES SUPPORTING CREATIVE DESIGN WORK

David CANNON¹ and Tuuli UTRIAINEN²

¹Center for Design Research, Stanford University

²Business Engineering, Lucerne University of Applied Sciences and Arts

ABSTRACT

Our physical and social environment — the ‘space’ we are in — clearly affects how we feel, interact, and what kinds of actions we engage in. The relationships between behaviour, mood, thinking, and space are continually studied in ergonomics, and discussed in architecture. But ergonomics focuses on relatively well-quantifiable details, and architectural writing most often concerns itself with ambitiously large subjects — whole buildings, cities, history, and sweeping abstractions. Between these two there is a need for more pragmatic, mid-scale guidance for the day-to-day design, redesign, and use of our spaces. Such guidance mustn’t rely on a surface mimicry of what exists. We need a better understanding of how a space’s various less-measurable objects and arrangements, the tangible aspects of socio-cultural environment, and so on, change the way we behave and are. For design education, such mid-scale guidance would be especially useful in the design of spaces for the activities of design itself. How should we adapt the many effective aspects of such spaces for design teams learning and working in a broader variety of cultural and intercultural settings? In this paper, the authors draw on their experiences contributing to and working in several spaces for design work and education, and on existing literature and a long heritage of similar spaces. From this, we offer a short list of guidelines, with examples, by abstracting a set of salient characteristics of effective spaces for design, that can be adapted for different needs, people, and cultures.

Keywords: Design space, creative teamwork, prototyping facilities

1 INTRODUCTION

“If you want to start running this class, the first thing you need is space”

— Prof. Larry Leifer, co-leader for ~20 years of the ME310 project-based graduate design course at Stanford University.

To anyone with design experience, it will go without saying that rooms, areas, spaces, and so on are important to the effectiveness of the designers and design teams that work in them. They are as important as any other tools or methods. It appears to be deeply human — perhaps as deeply human as our facilities for language, and for design — to adapt our spaces as best we know how to our working and living needs, and in turn our work and needs to the available spaces.

A recent book, ‘Make Space’ [1] offers a well-written and illustrated account of the thinking behind and development of the working spaces at the Hasso Plattner Institute of Design, or d.school, at Stanford University. In many ways, these d.school spaces draw on a rich heritage of architectural studios, workshops, garages, design ateliers, and places in which such skilled hands-on work is conducted. Good workshops reflect decades, even centuries, of accumulated experience, often elaborated on and refined from generation to generation.

The book describes both the kinds of thinking and experimentation that were applied, many of the lessons learned, and also shows a number of the exemplary furnishings and infrastructure that are found there — going so far as to list some of the places where one can buy materials out of which they can be built.

For people with access to similar resources, and acting in a similar culture, the book can serve as invaluable guidance. Our experience tells us, though, that guidance like this can be less useful for different locations. Indeed, such guidance can become misleading, if one attends too closely to the easily-apprehended, superficial, tangible aspects of a space for design. There is ample room to understand this guidance more deeply, so that it can be more useful, and to learn what it might teach us about human culture and human nature.

In the following section, we offer a list of characteristics that we have found in a number of spaces for design¹, that help explain many of the ways these spaces are effective. They are based on: a) our direct experience working in and experimenting with several places, principally those shown in Figure 1 (e.g. [2]); b) on knowledge, exploration, and stories shared with us by colleagues [e.g. 3]; and c) on our reading of literature — from studies of spaces that existed many decades ago [4] to several recent publications (e.g. [5]). Their purpose is to serve as concise, though for this paper skeletal, guidelines for a broader variety of people and circumstances where such spaces may be modified or created. Pictures illustrating some of the spaces referred to can be found in other publications ([1], [2], [3]); we refer the reader to these to conserve space in this short paper.

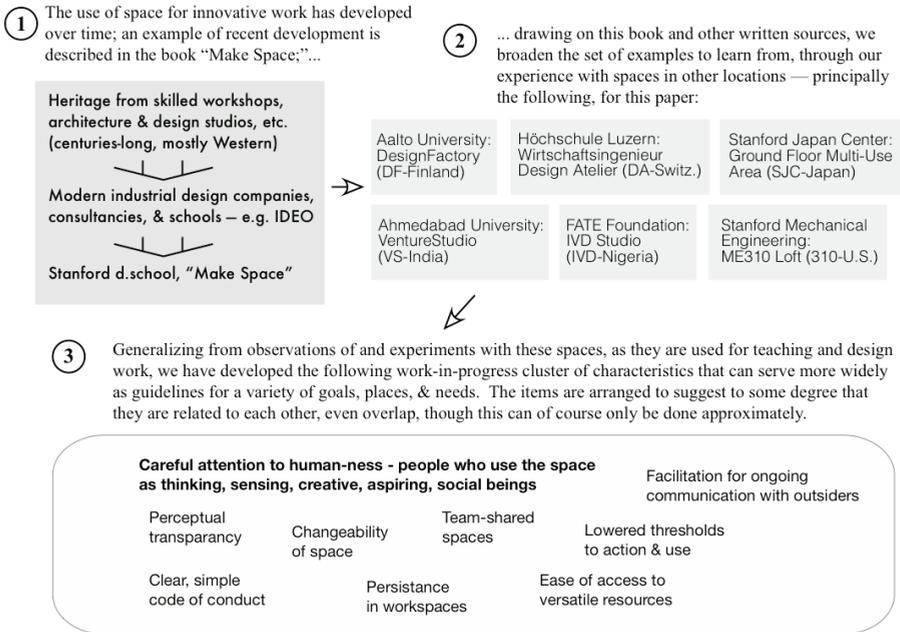


Figure 1. A simple depiction summarizing how our understanding of the use of space can be traced from its main sources — from (1) historical practice, received culture, and case-study literature; through (2) experience in developing and working in several spaces with similar purposes in various countries; to (3) a work-in-progress set of characteristics found in many such spaces that contribute to their utility in support of design teams and education

2 A LIST OF CHARACTERISTICS OF EFFECTIVE SPACES FOR DESIGN

We’ve developed this list of characteristics that we find in most of the successful design spaces that we’ve worked in or surveyed. We developed it and continue to develop it in a ‘design-thinkerly’² way, with the user-focused, pragmatic, and rapid-prototype-to-learn orientation that this implies. These characteristics are listed in the following sub-sections.

We illustrate the characteristics on this list with examples (in bulleted lists), most of them from the spaces for design work and design learning that are listed in Figure 1. These spaces are in a variety of locations in Europe, Asia, Africa, and America, which has improved our opportunity to see what they have in common — to see *why* they are effective, rather than just *what* they consist of. We’ve distributed the examples so, as we judge, each particular characteristic is most clearly illustrated.

¹ We avoid use of the term ‘design space’ here. In design research, the term has come to mean an abstract, usually formal set of configuration possibilities, and so doesn’t at all fit the tangible subject we are treating.

² We temporarily coin this odd but perhaps evocative phrase a bit light-heartedly, as a verbal mash up in homage to phrases that have become associated with people like Nigel Cross [6] and David Kelley [7]. Such pioneers are prominent in their identifying, articulation, and refinement of ‘design thinking’ as an effective culture of innovative work.

Other than the first item, the order is not especially significant. In the examples, particular spaces for design are abbreviated as found in Figure 1., e.g. Aalto University's Design Factory in Finland is shortened to DF-Finland.

2.1 Careful attention to our human-ness

User-centred design is a hallmark of current best-practice in innovation, and so it makes sense to make a priority of attending to the designers who work in these spaces as human beings.

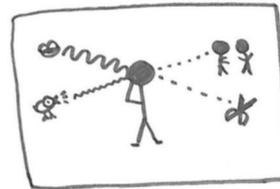


Effective spaces take into account, in simple ways, many of our attributes and needs as homo sapiens. This includes traditional ergonomic considerations, and expands on them. For example, among these considerations are the typical duration and size of short-term memory, and how the tangible world can serve as memory and thinking aid. Further considerations range from our physical needs for food and light, to our psychological needs for social engagement and belonging; from our need for undistracted individual focus, effectiveness and control in our actions, to the group needs for shared goals, work, negotiated boundaries and responsibilities; from the dexterity and limitations of our hands and bodies, to the habit-boundedness and flexibility of our minds and imaginations.

- A hammock can be found in the 310-U.S. space; couches and other informal furnishings are to be seen in DF-Finland, SJC-Japan, and IVD-Nigeria. They can be used for relaxation, and to change the 'atmosphere' for meetings, but their presence also signals something that may be more important: a recognition that strenuous work isn't possible without breaks.
- Pens, pencils, and places for sketches and notes are of course present in all spaces. It is perhaps universally recognized that they help to capture, communicate about, and rework ephemeral ideas, before they fade from short term memory.
- Snacks and meals are often enjoyed in these spaces, during work and 'after hours' (if there is such a thing in design work). Occupants can both keep up their energy, and enjoy the social lubrication that shared food has provided for us and our ancestors for millennia.

2.2 Perceptual transparency

The ways we engage and use a space can be said to be mediated in two ways: through our senses, and through our bodily actions. Our senses can be regarded as extending our thoughts, imaginations, and intelligence — and not just figuratively, but to a degree physiologically [8]. A well-managed space offers us peripheral awareness so that the many things and people around us bring possibilities to our minds, keep us apprised of others' insights and work. A space is more effective for design and team work when its occupants can manage this perceptual awareness by degrees, rather than only by the binary opening-and-shutting of opaque doors.



- In an open space, it is easy to see who else is present and what activities they are engaged with. The teams in DF-Finland & 310-U.S. have audiovisual connections to other team spaces and the prototyping area.
- Tools are hung on walls instead of put behind closed doors. A picture representing the content is put in the front, if tools are kept in boxes.

2.3 Team-shared spaces

Teams are the core unit of project-based design. They need a degree of autonomy and responsibility to be most effective. This is most tangibly reflected and reinforced when each team has a central workspace that the members can configure and learn to best use in pursuit of the project's aims. At the same time, this space should be reasonably transparent to others, so that each member can be informed of the many things others are doing.



- Teams are separated from other teams with only such simple means as a movable whiteboard or wire shelving in IVD-Nigeria, DF-Finland, and 310-U.S. In some cases, there is only open space separating teams. This makes cross-team communication almost inevitable.
- Tasks are often shared with other teams (e.g. cleaning up the Loft, making food, asking a question from the teaching team, prototype testing).

2.4 Persistence in workspaces

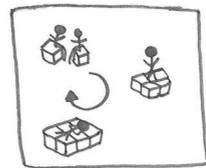
Any project that involves a variety of tangible materials — which is especially true of prototyping — involves complexities that can be made easier to deal with if the materials can be left for a period of time without being entirely cleaned up. The simple arrangement of the materials of a project can help people deal with the complexity in a number of ways. Putting up data points helps to saturate project related information and form insights. Old prototype parts might be used to form new compilations. In a dedicated space it is easier for the team to be mindful of the process and pick up where they left.



- Teams in DF-Finland and 310-U.S. have designated workspaces. One of the first assignments for each team is to “design your space.” The teams get a budget and they get to include elements in the space that makes it their home for the next 8 months. This exercise serves as team building and it also raises ownership of the space and the project.
- The teamwork spaces are plastered with visual material related to projects. This includes such things as quotes, saturated charts, pictures of the users and the team members, to-do lists on whiteboards, and project specific prototyping material at each table.

2.5 Changeability of spaces

When a team is working on an open-ended design brief it is impossible to anticipate which kind of space they will need and what kind of prototypes they will implement. One team can create a grocery store counter from the future while another is making a new toothbrush. Needless to say, that for both teams to be able to have a functioning space, it needs to adapt to very different needs.

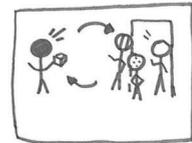


All of the design lofts we’ve been to, serve as a home to a multitude of activities: design team meetings, lecture venues, social events and parties, prototype building and testing sites, to mention a few. The demand for adaptability is prominent, especially when more space is not an option. Too much space can separate people and activities, and lower the intensity of the design loft atmosphere.

- Space is “grabbable.” Meeting rooms near to the DF-Finland central loft areas are often used for building “environments” for prototypes. A plywood car cockpit was created in such a space. On another occasion the space got turned into a proton therapy treatment room with a changing audiovisual setting for testing user experience.
- Central sofas in DF-Finland and 310-U.S. are used for e.g. video conferencing with global teams, playing games, casual team meetings, teaching team meetings, entertaining guests, as prototyping material.

2.6 Facilitation for ongoing communication

As E.M Forster said “How can I know what I think before I say it?” A design loft is a place for an ongoing exchange of project related information. The design teams communicate regularly with global partners, other teams, external experts, teaching teams and the whole design class. Inputs are often given by guest lecturers who serve as a good sounding board, teams have industry coaches and liaisons coming over to get access to industry relevant information.



- Video conferencing tools are central in 310-U.S. They are situated in the middle of the room instead of being locked in peripheral meeting rooms.
- In DF-Finland each team produces a poster about their re-defined understanding of the project. The poster is hung in the team space and helps to clarify and communicate the teams mission for visitors.
- In IVD-Nigeria it only takes a simple, large carpet to set aside a space for presentations and discussion; teams can gather from their adjacent team spaces to learn from visiting experts.

2.7 Ease of access to versatile resources

A design team needs to have access to tools, materials and experts to be able to do efficient design work. Materials with which to make prototypes must be on hand, in surplus, and they need to be versatile — of a sort from which many



kinds of things can be easily built. Even scrap can be highly useful for learning-through-building. One role people fill is as resources for others. Experts on process or fabrication methods are a valuable asset to have at hand. These are complemented by access to suitable books, videos, online information, and so on. If it is true that versatile materials multiply possibilities, then this is even more true for experience and information as resources.

- Basic prototyping tools & materials are in the same rooms as the teams' workspaces in DF-Finland, IVD-Nigeria and 310-U.S., and are very close by in the other locations. Tools include light tools such as hot glue guns and slightly heavier tools such as power drills and saws.
- In DF-Finland, electricians and milling specialists are daily on site. They are ready to assist any student who'd like to operate a machine but lacks the needed skills. The experts also help the students to understand, what different machines can be/could be and should be used for. The workshops near most of the other locations are similarly staffed.

2.8 Low threshold to action and use

A shortage of materials can stifle design work; likewise, the space itself can inhibit action. When exploration of the unknown and innovation are called for, planning can only provide scaffolding for work, and repeating familiar, predictable patterns will tend to discourage pursuit of promising opportunities when they are glimpsed. The word 'agile' is overused these days, but the items in a space, and the very ways that space is laid out, can erect barriers to moving as needed from one work pattern or location to another. If, for example, the tools needed to try an idea are at a distance from the places where possibilities are discussed or common ground among team members is established, then the probability that ideas will be tested can be significantly reduced. There are myriad reasons that people might be slow to adjust their activities and use of things around them; most of them we are barely conscious of if at all, and this is especially true for people learning design. These barriers can be lowered, and associated habits of adapting to the unpredicted; shifting demands that are revealed as a project moves forward can be encouraged. Spaces that are reconfigurable are helpful; when possible it is advantageous to locate areas that must have separately specialized uses near each other; items should be durable so that experimental use of them isn't thought of as risky.

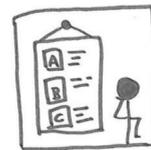
- High chairs are used in d.school at Stanford and TU Delft to facilitate easy movement. In d.School low, slightly uncomfortable chairs are used, when the teams need encouragement to move towards action from planning mode.
- Proximity of tools, materials and experts encourages students as they watch each other when engaging in unfamiliar design activities that might lie outside their comfort zones.



2.9 Clear, simple code of conduct

Every workshop has a set of rules, if only to encourage the safe use of tools. The rules usually also lay out the basics of consideration for others who will also be using the space. Common rules include putting movable tools back in well-known places so that others can quickly find them, and cleaning up scrap material one has cast off as one way of taking proportional responsibility for one's own actions. Starting with such concrete rules about how to be considerate of others, more abstract values of consideration and respect can usually be grown by daily example.

- The space might have a "janitor/curator/care taker" who manifests the rules. In DF-Finland there is a person taking care of the facility, in DA-Switzerland there is a designated person responsible for the space.
- Visual representations of tools are drawn on walls where they hang — this helps students to know where to return the tools.
- In DF-Finland there are guidelines & images on how a space or a tool (e.g. whiteboard) should look like before and after use. The guidelines are glued in visible places, as is also the case for the atelier rules in DA-Switzerland.



3 CONCLUSION

There are some things that might commonly be found on a list like this, which we haven't been specific about due to, top-level of emphasis. They include, for example, such things as varying

degrees of ‘sense of ownership’ of parts of the facility by the individual or team, and lots of horizontal and vertical surfaces for drawing, posting, and making things [9]. Both of these examples and more, we take for now as subsumed in the above list, cutting across several items.

As a design-thinkerly work-in-progress, at least the following should be understood about this list of characteristics, especially when taken as guidelines:

- We don’t claim that the list’s item definitions are in some ideal state — indeed, we don’t anticipate that any such list can be in a kind of ideal state — only that they are useful and well-considered;
- we don’t claim that the list is exhaustive, or than an exhaustive list could be developed — only that it generalizes and encompasses elements which we have found beneficial in design work shared across many sites;
- we don’t claim that the items on the list are ‘orthogonal’ or ‘disjoint,’ as a scientific list might attempt to be — only that it provides a usefully concise way to view existing spaces, and that it can serve as guidance to evaluate spaces being planned, developed, and modified;
- none of the spaces for design that we’ve reviewed should be considered an ideal in all areas; tradeoffs always need to be made, and are best made according to local constraints and demands.

We continue to examine the effective spaces we have the opportunity to work in and visit, to confer with others with like interests, and to experiment with the application of these guidelines. We are pursuing more opportunities to broaden the background and examples from which we can draw.

The space that design work happens in can support or hinder the work done by the team in multiple dimensions. Though human factors such as good team dynamics are most important for the success of a project, space can help overcome a multitude of technical and behavioural obstacles experienced in the day-to-day life of design teams.

ACKNOWLEDGEMENTS

In addition to countless people who have given us the chance to work in, teach in, shape, and observe others working the many spaces that we’ve had access to, we’re particularly grateful for insight we’ve gained from Neeraj Sonalkar, The FATE Foundation, and those who’ve made possible the various workspaces at Hochschule Luzern (The Luzern University of Applied Sciences and Arts), Aalto Design Factory and Stanford University.

REFERENCES

- [1] Doorley, S., and Witthoft, S. *Make Space: How to Set the Stage for Creative Collaboration*, 2011 (John Wiley & Sons, New York).
- [2] Sonalkar, N., Mabogunje, A., Parmar, V., Cannon, D. M., and Leifer, L. A Testbed for Studying Venture Design Teams in Emerging Markets. *Proceedings of the 12th International Design Conference DESIGN 2012*, 2012, pp. 561–568.
- [3] Lande, M. *Work in Progress: Making Room: Creating Design Spaces for Design Practice*. 2012 Frontiers in Education Conference Proceedings, pp. 1–5
- [4] Pretzer, W. G., and Pretzer, W. S., eds. *Working at Inventing: Thomas A. Edison and the Menlo Park Experience*, 1989 (Henry Ford Museum and Greenfield Village, Dearborn, Michigan).
- [5] Lerdahl, E. *Staging for Creative Collaboration in Design Teams: Models, Tools, and Methods*, 2001, Doctoral Thesis, Norwegian University of Science and Technology.
- [6] Cross, N. G. Designerly Ways of Knowing. *Design Studies*, 1982, 3(4), 221–227.
- [7] Brown, T. The Making of a Design Thinker. *Metropolis* Oct. 2009, pp. 60-62.
- [8] Arnheim, R. *Visual Thinking*, 1972 (University of California Press, Berkeley, California).
- [9] Vyas, D. M., and Nijholt, A. Artful Surfaces: An Ethnographic Study Exploring the Use of Space in Design Studios. *Digital Creativity*, 2012, 23(3-4), 176–195.