Environments for successful interaction

Nigel Oseland, Alexi Marmot, Felicity Swaffer and Sophia Ceneda

AMA Alexi Marmot Associates, London, UK

Abstract

Purpose – This paper aims to share recent research to inform the design and facility management community on how to design and operate offices that enhance interaction, creativity and ultimately innovation.

Design/methodology/approach – A two-year applied research project was conducted which involved a literature review followed by field studies. Surveys conducted in the offices of five diverse organisations piloted new methods for investigating interaction, termed WorkWare^{CONNECT}.

Findings – Key findings include: more meetings occur in office buildings with more meeting space; on average meeting rooms are used 37 per cent of the time; the quantity and quality of space is important but does not overcome organisational factors; much creative thought takes place alone.

Research limitations/implications – Conducting fieldwork in the real world has its limitations. For example, only five organisations were surveyed and therefore the results may be considered by some not to be representative. However, the paper considers that the data collected in real offices are realistic and valid.

Practical implications – The research resulted in a calculator for determining meeting room numbers and sizes, a system for prescribing the best media for interaction, design guidelines for interaction spaces, and guidance on the etiquette of successful meetings.

Social implications – In the current economic climate many organisations focus on reducing costs and under-cutting competitors. However, it is innovation that gives businesses a competitive edge and innovation starts with good interaction and creativity.

Originality/value – The recommendations are drawn from both the design and management communities. The research has resulted in practical advice to facilities managers, designers and the business heads.

Keywords Innovation, Design, Facilities, Conferences

Paper type Research paper

1. Introduction

1.1 A new innovation economy

It is generally acknowledged that the Western World has undergone three key stages of industrial evolution represented by three economic sectors (Fourastié, 1954):

(1) *Primary*. Relating to the extraction and production of raw materials, e.g. mining and agriculture;

(2) *Secondary*. Involving converting raw materials into products, e.g. manufacturing and textiles; and

(3) *Tertiary.* Providing services and information to customers, e.g. financial, retail, media, technology, healthcare and education.

Approximately 70 per cent of employees now work in the service industry and are referred to as knowledge workers, a term first coined some fifty years ago (Drucker, 1959). The UK's proclivity for trade and seeking to reduce labour costs means that through the ages its industry has outsourced its main economic activity and then through innovation progressed to the next industrial age. In the early twentieth century the UK lead the way in importing agricultural commodities, in the 1950s it moved away from heavy manufacturing and focussed on light industry and later in the 1970s onwards it off-shored to the developing economies in the East. More recently, large companies have off-shored parts of the service industry to the East to gain a commercial advantage by offering the same services as their competitors at a reduced cost. However, the downside of setting up overseas is that eventually the overseas providers may establish themselves as credible in their new industry, then start producing their own products and ultimately trade directly thus missing out the "middle man". This was particularly evident with manufacturing, such as the car industry, and more recently with technology. Due to the World Wide Web, information is ubiquitous such that "knowledge is not king"; it therefore follows that the service industry is particularly vulnerable to copycatting and undercutting. So to maintain a competitive advantage, businesses need to look towards the next economic sector.

The notion of a Quaternary sector of industry has been around for some time; it principally concerns intellectual activities such as handling information, providing advice, entertainment, culture, government, research, and information technology. Some economists argue that the quaternary sector is a sub-set of the tertiary one, but most seem to agree that there is an emerging creative and innovative economy. *Business Week* magazine reported "the knowledge economy as we know it is being eclipsed by something new – call it the creativity economy ... the game is changing, it isn't just about math and science anymore, it's about creativity, imagination, and, above all, innovation" (Nussbaum, 2005). Basically, for the UK economy to survive just having good knowledge is not sufficient; it is essential that businesses are innovative, applying their knowledge, and it therefore follows that ideas and creativity are the real asset. The UK has a long history of innovation but, bar a few niche products, it might be argued that the UK is not leading the way as well as it has done in the past. The authors believe that interaction, whether planned or impromptu, is a fundamental part of the process of creativity and innovation and recognise that intermingling is also key (Drucker, 1959).

1.2 Defining interaction
The subject matter of interaction, creativity and innovation is described in many ways. Figure 1 illustrates the circle of interaction to innovation and is an attempt to simplify some of the different terminology used. The cycle commences when some information, organised facts and data, is generated and refined by an individual ready for communicating, to others. If a person responds to the information, or if the same or other information is exchanged between two or more people, then an interaction has occurred; the idea of a two-way effect is essential in the concept of interaction, as opposed to a one-way causal effect. Receiving new information could be said to increase the knowledge base, but knowledge is more associated with acquiring a real

Figure 1.
The interaction-innovation
cycle

understanding of and familiarity with related information. Knowledge can be gained through solo activities, e.g. web browsing, as well as interaction. However, at some point interaction with others is required in order to share views and challenge the views of others in order to test and improve the knowledge of a subject. Colleagues may choose to collaborate and work together to further extend their knowledge. Through a combination of collaboration, sharing of knowledge, and through personal reflection and insight, new ideas may then be created which go beyond existing knowledge. An invention uses novel ideas to design a unique product or process. The final stage is innovation, when an idea is implemented to make a radical change in thinking, or develop a new product or process.

There is a large body of research (e.g. Cross and Parker, 2004) which links social capital with increased knowledge transfer, where social capital relates to the number and strength of social ties that is, previous interactions and relationships. Social interaction is therefore another mechanism for enhancing knowledge transfer that accelerates the steps in the interaction-innovation cycle.

It is evident that "knowledge work is a highly cognitive and social activity" and collaboration includes bouts of solitary work and social interaction (Heerwagen *et al.*, 2004). Research has also shown that each time workers are interrupted when focussing on a task, it can take up to 15 minutes to recover their "state of flow" or level of concentration (DeMarco and Lister, 1987). Psychologists, such as Broadbent (1958), have reported that a natural reflex action means that colleagues are always unconsciously listening and processing information, which can be counter-productive when the information being processed is irrelevant to performance of the individual or team. This may be why a noisy café can be less distracting than the open-plan office because the surrounding conversations are less meaningful and filtered out. Another psychologist (Altman, 1975) noted the importance of controlling the level of interaction, or privacy, as too much interaction can lead to stress by feeling overcrowded and too little interaction can lead to feelings of isolation.

The authors therefore acknowledge the importance of providing spaces for both interaction and spaces for concentration and the right balance of such environments. Nevertheless, the focus of this paper is on the conditions and environments required for good interaction, rather than for quiet and concentration. The authors do not propose an environmentally deterministic approach whereby good interaction facilities will automatically lead to productive interaction between colleagues, but instead recognise the complex interplay of space with organisational, technological and social factors.

The research concentrated on face-to-face interaction rather than virtual interaction. Again the authors acknowledge the benefits of virtual interaction, particularly with the aim of reducing travel and the associated carbon emissions, but clearly there are occasions when face-to-face interaction is more appropriate and vice versa. Although the technology of virtual interaction has advanced tremendously, it still does not convey well the "spatiality of human interaction", which includes context/pointing, gesticulation, judging reactions and non-verbal communication. Barbour and Koneya (1976) famously claimed that 55 per cent of communication is non-verbal communication, 38 per cent is done by tone of voice, and only 7 per cent is related to the words and content. Non-verbal communication is complex and involves many unconscious mechanisms eg gesture, body language, posture, facial expression, eye contact, pheromones, proxemics, chronemics, haptics, and paralanguage. So, although virtual interaction can be valuable it is not a replacement for face-to-face interaction, particularly for initial meetings of individuals or teams. Furthermore, the increase in remote working has indicated that face-to-face interaction is important for motivation, team-building, mentoring, a sense of belonging and loyalty, arguably more so than in place-centred workgroups.

1.3 Conditions for interaction
A comprehensive literature review (Fayard and Weeks, 2005) revealed several key parameters for creating successful meeting spaces:

- *Proximity.* It is generally considered that the first law of geography is that "nearer things are more related than those further away" and research (Allen, 1984) found that the frequency of all forms of communication decrease with distance and significantly after 30 m, thus the proximity of suitable spaces for interaction is key.
- *Accessibility.* Ease of accessibility and the known availability of spaces for interaction is important, they need to be conveniently located with good visual access, so that signs of occupancy can be gauged, and their availability needs to be advertised or non-bookable (drop-in) spaces provided.
- *Privacy.* The spaces should provide a sense of perceived visual and aural privacy, which does not necessarily mean that an enclosed space is required for privacy; the spaces could have semi-partitioning, such as planting, or be distant or acoustically secure from those by whom the meeting participants would not liked to be overheard.
- *Legitimacy.* Relates to having a valid reason for being in the space where interactions may take place, e.g. a copy/print area or stairwell/corridor, or general knowledge within the organisation that it is acceptable/preferred to meet and mingle in spaces other than meeting rooms, offices or desks.

- *Functionality.* The layout and style of the furniture, the equipment provided (such as audio-visual), the environmental conditions (temperature control, air quality, light), the services provided (catering, AV support, room set-up) and the capacity, all impact on the suitability for different types of interaction.

Independent of the existing architectural guidance on how to size and lay out a meeting room is a whole set of literature on how to arrange and manage successful meetings (e.g. Hindle, 1998). It appears that there is little overlap between the guidance on how to arrange and manage meetings and that on how to design meeting spaces. The key reasons cited for interaction are:

- *Sharing information.* New information needs to be passed on to colleagues, the information may be new and complex or an update of previous information.
- *Making decisions.* The key aim of some meetings is to draw a conclusion and sign-off an agreed set of actions or outcome.
- *Generating ideas.* Groups may meet to brainstorm solutions to existing problems or generate ideas for new products and services.
- *Resolving problems.* This generally relates to resolving personnel issues and grievances.
- *Socialising.* It is acknowledged that meetings, albeit informal, are held for celebration or simply to catch up on non-work matters.

There are also a wide range of types of interaction, which could be planned (usually formal) or impromptu (usually informal), held locally or across locations, carried out between either two people or a larger group, and hosted virtually or face-to-face. When hosting a meeting, the reason for the interaction seems to be the logical starting point rather than, typically, considering the location and size of space required. A meeting room is only one possible option for facilitating an interaction and, depending on the reason for the interaction, not necessarily the best environment. Furthermore, even if a meeting room is considered the most suitable environment it is likely that it will need to be prepared and arranged to provide the optimal setting for the required type of interaction.

2. Methodology

AMA Alexi Marmot Associates conducted a two-year research programme part funded by the Department of Business, Innovation and Skills with assistance from University College London (UCL). The main research objective was to investigate how to facilitate successful interaction through better facilities and organisation. A secondary objective was to explore new tools for collating evidence on interaction and use of space. The new tools termed WorkWare[CONNECT] were to supplement AMA's existing five WorkWare tools: staff questionnaire, manager interview, workshops, space observation survey, and space audit. In total, seven new tools were tested:

(1) *Quality of Interaction Zone (QuIZ).* A checklist of five categories (accessibility, privacy, usability, comfort, quality) and 30 ratings which is used during an expert walkthrough to quantify the presence of environmental conditions for successful interactions.

(2) *Visual Field Analysis.* A means of assessing the percentage of desks and offices (i.e. occupants) which are visible to each other, the hypothesis being that greater visibility facilitates more interaction (Heerwagen *et al.*, 2004).

(3) *Space Interaction Survey.* An observation study, similar to Space Syntax, which traces movement and interaction throughout the space and identifies key nodes of interaction, popular spaces, or dead spaces and unused routes.

(4) *Interaction Profiling.* A short interview conducted with staff as they leave a meeting or informal interaction, focussed on accessibility, choice, meeting etiquette, layout and technology; questions on knowledge transfer and meeting success were also added to AMA's standard staff questionnaire.

(5) *Photosphere.* A workshop technique which uses 100 images of (e.g. meeting rooms, homes, beaches, parks, leisure spaces) to explore which environments are better suited for different types of interaction and solo activity.

(6) *Interaction Mapping.* A workshop technique for mapping the reasons for interaction with the various modes of interaction.

(7) *Social Network Analysis.* An abridged version of AMA's established questionnaire with additional questions to determine the number of colleagues with whom individuals associate with and to establish central points of contact; the assumption being that knowledge transfer is greater between those who have a social tie (Cross and Parker, 2004).

Field studies were carried out in the offices of five diverse organisations: a transportation company, charitable foundation, management consultancy, architectural practice and investment bank. In total, eight buildings were surveyed and 350 meeting spaces and approximately 3,500 meetings with 12,700 participants observed. The data collated also supplemented the existing WorkWare database of 60,000 people in 250 buildings. Approximately 150 of the office staff were consulted through interviews, workshops and Interaction Profiling. Some 470 staff, across three buildings, were invited to participate in an on-line survey focusing on interaction spaces; 207 responded resulting in a response rate of 44 per cent.

3. Seven key findings
Figure 2 shows a weak but statistically significant correlation ($r = 0.64$, $p < 0.05$) between the number of meeting room seats per occupant and the mean number of meetings per week per occupant for seven buildings where the staff were surveyed and asked about their meeting schedule. As the number of occupants per building varied, the regression analysis was weighted by the number of workstations. The small number of data points means that the correlation is not sufficiently robust enough to make generic predictions of the level of interaction but nevertheless there is a relationship. The first research result is therefore that the higher the ratio of meeting spaces to desks, the more meetings occurred. This sounds an obvious result and may not be causal but rather derive from the fact that organisations that already provide numerous meeting spaces do so to match their proclivity to interact.

However, the second key result is that the utilisation of the meeting rooms surveyed was only 37 per cent, almost identical to the 38 per cent benchmark in AMA's existing WorkWare database. The results indicate that whilst, the number of meetings is
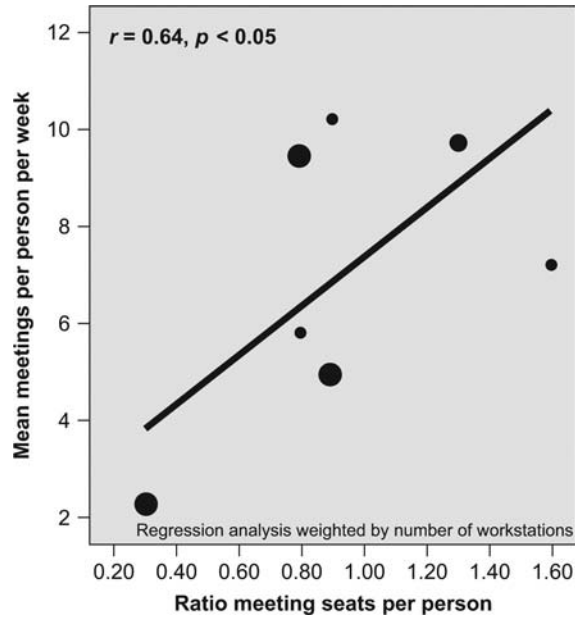
Figure 2.
Number of meetings
correlates with meeting
spaces

related to the number of spaces provided, the spaces are nevertheless under-utilised. The poor utilisation of meeting rooms is due to a number of factors, including the quality of the space and advertised availability, thus attaining the appropriate number of meeting spaces is a key challenge when designing the modern office. Based on the research and the data from previous design projects, a Meeting Room Calculator has been developed which uses utilisation and the expected frequency and size of formal and informal meetings to determine the number of meeting rooms required to support the organisation. The utilisation of informal meeting spaces such as casual seating areas in open work zones, was much lower than meeting rooms at 21 per cent. Interaction Profiling and observation indicated that informal meeting areas were less utilised either because the design was not as well considered as meeting rooms, and they were poorly located with little privacy, or because the organisational culture meant that holding meetings outside of meeting rooms was not the norm.

Expert walkthroughs, which included the QuiZ, were carried out in 84 meeting spaces in three buildings in the study. Figure 3 illustrates a good and statistically significant ($r = 0.80, p < 0.05$) correlation between the utilisation and QUiZ score; the eight data points represent the Quiz scores from all three building binned into 5 per cent increments. The third research finding is therefore that the quality of the space does indeed matter. Furthermore, the observed relationship means it is possible to predict the uptake, and implied success, of existing and new spaces for interaction using QuIZ.

Further analysis, backed up by observation, revealed that the key factors are accessibility and privacy. Whilst the spaces need to be conveniently located, they also need to offer a level of privacy, especially if located on the primary circulation routes. The office surveys repeatedly revealed under-utilised informal meeting areas which
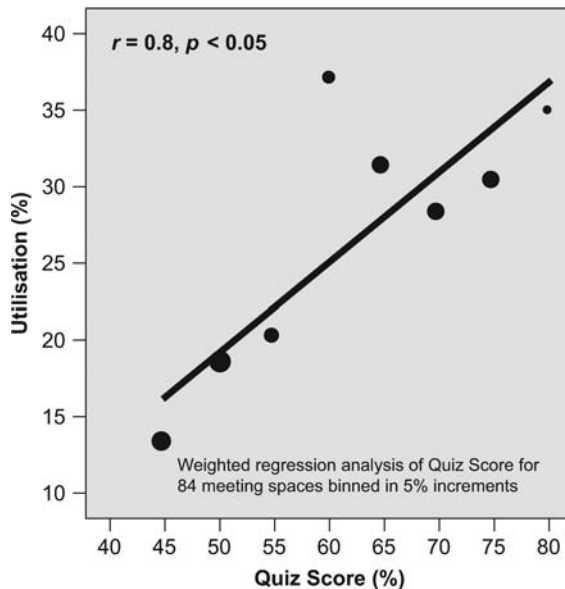
Figure 3.
Utilisation of meeting
space is dependent on its
quality

were often simply a cluster of seats, sofas and tables placed on circulation routes in clear view of passing colleagues. The Interaction Profiling showed that people do not like to travel a long distance to interaction areas and are likely to stay local unless the spaces entice them, for example by offering good refreshments, a pleasant ambience or a place to retreat. The more successful interaction spaces offered a balance of being conveniently located but offering a degree of screening.

The fourth finding is that only one-fifth of the interactions in meeting rooms used any form of technology. It is unclear if this is because the technology is not required rather than it is not available. The Interaction Profiling and QuIZ together indicate that meeting rooms with better facilities, including technology, were the first choice of meeting organisers. However, some responses also indicated that technology was not used in meeting rooms because there was uncertainty of what technology was available or it was simply too difficult to set it up. Many of the meetings taking place in meeting rooms were found not to require the formality of the meeting room however the cultural norm in the organisation required them to do so. The "meeting room culture" of organisations is difficult to break and requires provision of a range of different spaces for interaction and training/encouragement in when and how to use them.

The Space Interaction Survey and Social Network Analysis allowed the researchers to identify the people who were most visited by their colleagues and the ones with the largest number of social ties. The fifth key finding is that there is a significant correlation between the number of social ties and satisfaction with how the space supports teamwork ($r = 0.35$, $p < 0.05$) and informal meetings ($r = 0.32$, $p < 0.05$), supporting the literature review conclusions. Although key people were identified, and overlaid with key interaction nodes, it was found that their role was important and they would be visited regardless of their location. There is some logic in placing key people centrally where they can be easily visited but located so their regular

interactions do not disturb others. The fieldwork also showed that knowledge sharing is highest at the team level between co-located colleagues and weakest at the organisational level. Assuming that the various teams within an organisation have a common high-level objective, it seems important to look for ways to use the workplace to encourage cross-team interaction.

The penultimate finding is that although space matters it cannot alone overcome organisational predictors of successful interaction. The Interaction Profiling revealed that the success of formal meetings was largely due to good meeting etiquette. This involves appropriately arranging and managing the meeting; see Figure 4 and the details in Section 4. The survey respondents complained about too many meetings, particularly regular meetings to which they have little input but feel obliged to attend. Interestingly, the respondents also thought emails were over used and detrimental to relationship building. They report a trend to invite many people to meetings, or to copy them into emails, to satisfy a perceived need to canvas the opinion of all potentially interested parties.

The seventh key finding is that much creative thought and productive work takes place alone and/or away from the office. In the Photosphere exercise the participants were asked to select images which represented where they:

- are most creative;
- can concentrate best;
- prefer to meet; and
- are most productive.

Unexpectedly, none of the participants in any of the workshops selected images of desks or offices and only a few selected images of formal meeting rooms. The participants recognised that their best and most creative work is achieved outside of the normal office environment but felt that the bulk of their work, i.e. the processing of information, requires a desk and occasional meeting room. If today's office workforce are to remain as process workers, but to advance through the interaction-innovation cycle then clearly the balance of spaces in office buildings will need to change. At this stage in economic development the best solution is to provide a choice of environments that facilitate the different types of interaction but also support solo work requiring quiet and concentration.

Figure 4.
Physical and organisational factors for successful interaction

4. Recommendations

4.1 Settings for interaction

The two-year research programme has lead the authors to the conclusion that creating environments for successful interaction is as much about the organisational factors, such as arranging and managing meetings, as it is about the design and facilities of physical spaces. The first step to successful interaction is to educate office workers that there is a range of ways of interacting and that a meeting in a meeting room is not the only option. The most appropriate method of interaction is dependent on whether it is planned (formal) or impromptu (informal) and whether it is a one-to-one or a group interaction; virtual and personal (face-to-face) options are available for these two key variables, see Figure 5.

The main purpose of the interaction needs to be recognised: sharing information, making decisions, resolving problems, generating ideas, and socialising. The best setting is dependent on the purpose of the interaction, see Table I.

Preferred environments suited for different meeting purposes are summarised as follows:

(1) *Sharing information.* New and complex information needs explaining by the creator either in a local meeting room, with good projection facilities, or by webinar when the recipients are geographically distributed; the information can be sent out by email in advance but the recipients should be given the opportunity to respond in a shared forum rather than through numerous e-mails.

(2) *Making decisions.* Although some decisions involve a large number of stakeholders, in general decisions are made more quickly within smaller groups; consider locations which minimise interruption and keep the focus of
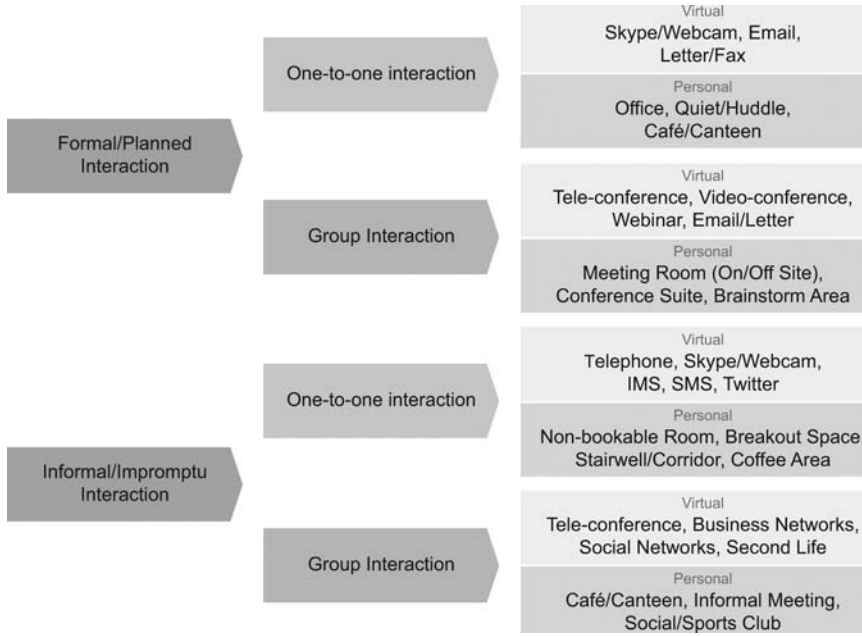

Figure 5.
Appropriate media for interaction

Interaction media	Sharing information	Making decisions	Resolving problems	Generating ideas	Socialising
Meeting room	✔	✔	?	?	×
Conference suite	✔	✔	×	?	×
Off-site hotel/conference	?	✔	?	✔	×
Brainstorm/war room	?	?	×	✔	×
Huddle/quiet room	?	✔	✔	?	×
Office	?	✔	✔	×	×
Informal meeting area	?	?	?	✔	?
Breakout	?	?	×	?	✔
Café/restaurant	?	?	✔	?	✔
Telephone	✔	✔	?	?	✔
Tele-conference	?	?	×	?	×
Video-conference	✔	?	×	?	×
Webinar/Webex	✔	×	×	×	×
E-mail	✔	✔	×	?	?
Letter	?	×	?	×	×
IMS/SMS/Twitter	?	×	×	✔	✔
LinkedIn/ning	?	×	×	✔	✔
Social networking sites	×	×	×	×	✔
Second life	?	?	×	?	✔

Notes: ✔ = best media; ? = useful media; × = unsuitable media

Table I.
The main purpose of interaction

the group for example a discreet meeting room or off-site conference room; consider the layout of the room and the where the participants should sit.

(3) *Resolving problems.* The office, especially if on view, is not always the best place to resolve personnel problems; consider a quiet café or restaurant, the key is to not be overlooked by colleagues.

(4) *Generating ideas.* Creativity, brainstorming and flow of ideas can benefit from taking place outside of a formal setting; consider different and stimulating spaces and ensure there is good equipment for capturing ideas and breaking out into smaller groups if required.

(5) *Socialising.* Spaces offering food and drink, recreating the "watering hole" are best; also consider meeting outside of the office building to clarify the break from work.

4.2 Improving interaction facilities
In terms of the physical space and facilities, we identified many common problems that need rectification. For example, to counter the main problems with meeting spaces identified during the fieldwork it is necessary to provide:

· control of temperature control and air quality;
· adequate daylight, and control of daylight especially when using data projection;
· good acoustics to eliminate transmission of sound between rooms or noise from outside;
· well designed and flexible furniture that can be easily reconfigured;

- essential basic equipment and accessories such as IT and AV, coat and bag storage, clock, power and data points or wireless broadband with guest access;

- sufficient circulation space, within and outside the room, and an appropriate room size/shape;

- the appropriate level of technology, with well designed controls, and sufficient instruction and training in how to use it;

- well organised and safe cable management, and seamless technology;

- colour and inspiration; and

- wayfinding, easily located rooms and clear labelling.

4.3 Improving organisation of meetings
Once the venue is selected it is also important that the meeting is well organised including how it is arranged and managed. Some key factors for planned meetings are:

(1) *Purpose.* Confirm the need to meet, draft and issue the agenda and draw up a list of key participants.

(2) *Arrangement.* Determine the most appropriate location and time that allows key participants to attend.

(3) *Control.* Appoint a chairperson to ensure the meeting runs on time, follows the agenda, and controls the input of the participants.

(4) *Action.* Appoint someone to take minutes and ensure all actions are captured and followed up before the next meeting.

4.4 Improving booking systems
Booking systems can be improved by:

- containing data fields that include the purpose of the interaction, matched to the location;

- offering precise descriptions of the available layouts, IT/AV, catering;

- allowing flexibility in the period of booking, including setup and dismantle time;

- suggesting alternative solutions if the requested space is unavailable;

- linking to real time display panels at the entrance to the space; and

- generating automatic requests for updates to the booking shortly before the event.

5. Conclusion
The authors believe that creativity and innovation is vital to economic development and that interaction is a fundamental step towards it. A two-year research programme employed a variety of new methods to explore the conditions required for successful interaction. The research showed that successful interaction is dependent upon both physical and organisational factors. Educating office workers in the purpose of interaction and the different media for interaction is as important as the provision of the right number of well designed spaces for interaction. The literature review revealed that innovation involves bouts of interaction and solo activity and it is critical that office buildings provide a choice of spaces to support the various work activities.

The research was conducted in occupied buildings and access was granted by clients of the authors. There are always limitations to conducting "real world" research such as the sample size and makeup, the length of time that studies can be carried out and the lack of control conditions. Nevertheless, the research has identified seven key findings which provide a better understanding of how interaction can be improved in offices, and these finding have been converted to some basic recommendations. However, the findings and recommendations are based on a limited data set and further research in more or larger organisations would help confirm the generalisability of the results. The paper began by acknowledging that interaction facilitates innovation which can improve the economy, however despite recent efforts (such as Haynes, 2008) research proving the causal relationship between interaction and productivity is quite limited.

References

Allen, T.J. (1984), *Managing the Flow of Technology: Technology Transfer and the Dissemination of Technological Information within the R&D Organization*, MIT Press, Cambridge, MA.

Altman, I. (1975), *The Environment and Social Behavior*, Brooks/Cole, Monterey, CA.

Barbour, A. and Koneya, M. (1976), *Louder than Words: Nonverbal Communication*, Merrill Publishing Company, Columbus, OH.

Broadbent, D. (1958), *Perception and Communication*, Pergamon Press, London.

Cross, R. and Parker, A. (2004), *The Hidden Power of Social Networks: Understanding How Work Really Gets Done in Organizations*, Harvard Business School Publishing Corp., Boston, MA.

DeMarco, T. and Lister, T. (1987), *Peopleware: Productive Projects and Teams*, Dorset House, New York, NY.

Drucker, P. (1959), *The Landmarks of Tomorrow*, Harper & Brothers, New York, NY.

Fayard, A. and Weeks, J. (2005), *Photocopiers and Water-coolers: The Affordances of Interaction*, INSEAD Working Paper Series, Fontaineblau.

Fourastié, J. (1954), *Die Grosse Hoffnung des Zwanzigsten Jahrhunderts* (*Great Hope of the Twentieth Century*), Deutz, Köln.

Haynes, B.P. (2008), "Impact of workplace connectivity on office productivity", *Journal of Corporate Real Estate*, Vol. 10 No. 4, pp. 286-302.

Heerwagen, J.H., Kampschroer, K., Powell, K.M. and Loftness, V. (2004), "Collaborative knowledge work environments", *Building Research and Information*, Vol. 32 No. 6, pp. 510-28.

Hindle, T. (1998), *Essential Managers: Managing Meetings*, DK Publishing Inc., New York, NY.

Nussbaum, B. (2005), "Get creative! How to build innovative companies", *Business Week*, 1 August, available at: www.businessweek.com/magazine/content/05_31/b3945401.htm (accessed 10 December 2009).

Corresponding author
Alexi Marmot and can be contacted at: alexi@aleximarmot.com