Lighting: what the users say

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This covers ...

- How important is lighting to users, given the context?
- The most important things from the users' point of view.
- How lighting is perceived to affect user productivity.
- Lessons and rules of thumb for designers.

Based on user research in 170 buildings worldwide by Building Use Studies

How important is lighting to users ...?

- Lighting becomes more important to users when other aspects of basic environmental conditions - heating, cooling, ventilation and noise - are failing.

- Ambient conditions must properly support varied tasks.

- Users invariably say they have too little natural light and too much artificial.

- Lighting control becomes more important the less occupant control users have over other services.

- Lighting control systems failures' annoy users.

Lighting is usually fourth in the users' pecking order: behind heating, cooling, ventilation and noise

In recent years ...

- The range of tasks that people undertake in offices have greatly widened, as have the associated visual requirements.

- Buildings have become more complex and intensively used.

- Furniture and equipment arrangements have become less predictable.

- Users' expectations of the internal environment have become greater and more varied.

- Regulatory constraints have tightened.

This makes it more difficult to find conditions which suit everybody tolerably well, and makes attempts to provide fully automatic control to suit average needs potentially futile.

What the users say #1 ...

Context: Deep-plan, AC office, good on overall comfort (94%ile), noise (98), ventilation in winter (80), ventilation in summer (86), perceived productivity (82), glare from sun (10) glare from lights (1)

A lot of glare from sun, sky and reflections from other buildings. Cannot stop glare through windows of corner office behind me..

Artificial lighting could be better, too much sunlight at times.

At certain times of the day the sunlight can be blinding. Tinted windows would be nice, so we don't have to close the blinds.

Because none of the offices have blinds in windows facing the floor, I have to keep the blinds on external windows closed all the time in consideration for my staff. Even though, I would like to have them open at times so as to see some natural light - particularly now when it is dark coming to/going home from work.

Blinds are closed most days throughout the office - not enough natural light.

Blinds are generally kept closed making offices quite gloomy..

Blinds do work to cut glare but create a very gloomy environment when all on the floor are closed..

Blinds leave gaps - mornings and summer afternoons are a pain = light on VDU and I have to move to avoid sun..

Blinds need to be kept shut during the day to stop glare...

What the users say #2 ...

...The blinds do not fit well and on sunny days the sun's glare cannot be blocked out - also opening blinds gives too much glare..

The blinds have to be closed all the time as someone will get a glare on their monitor..

The lighting is awful, too yellow and over bright..

There can be some glare from lights on PC..

Too many fluorescent lights on the open floor which provides too much glare..

Too many reflective surfaces inside and outside the building..

We get a lot of glare off the Winter Garden next door..

We have to open and close the blinds several times a day to prevent glare or to give some light - as very dark..

When it's a bright day we have to shut out all natural light due to the glare on our PCs.

When the sun comes out most of the blinds are closed due to the glare. Not much light is allowed in.

Would be good to have automatic blinds that respond to sunlight. Often have to ask colleagues if I can close blinds..

70 out of 451 commented on lighting

Blinds down, lights on ...

Excellent buildings: occupants' hit list

1. Stable thermal conditions, winter and summer, with effective user intervention if conditions become uncomfortable.

2. Rapid response when things go wrong (especially with respect to 1., and, additionally, for safety and security).

   Where 1. and 2. do not apply, at least the ability to trade-off one undesirable thing against another (e.g., in the height of summer, too hot or too noisy but not both).

3. Convenience, with action brought to the point of need, coupled with ease of use.

4. Absence of unwanted interruptions.

5. Adjustable furniture, especially chair and VDU.

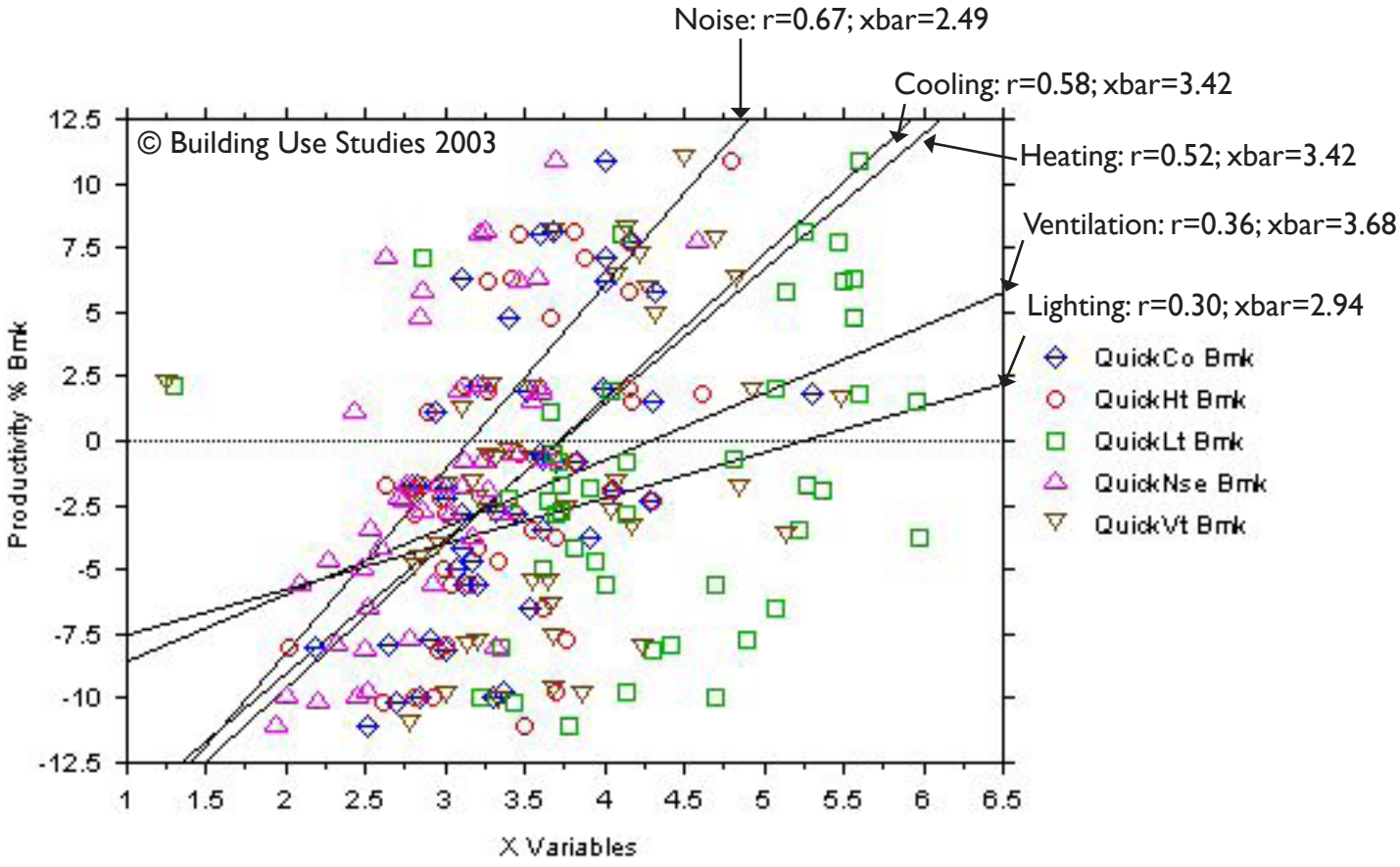
6. Cleanliness.

7. Natural light almost always preferred to artificial, but not if glare or solar gain out of control.

8. A modest image for the building with no gratutitous design gestures.

9. No conspicuous waste.

Quickness of response ...



All variables are significant at p=0.04 or higher

Occupants tend to ...

- Act **in response** to random, external events rather than in anticipation of them.
- **Take decisions** to use switches and controls only **after an event** has prompted them to do so.
- Often wait before they take action and, typically, when they reach **a "crisis of discomfort".**
- **Over-compensate**.
- Operate the most **convenient** rather than the most appropriate controls.
- Take the **easiest** and quickest option.
- **Leave systems** in their switched state.

Better outcomes are usually achieved where occupants understand design intentions

from Leaman A, Window Seat or Aisle, Architects' Journal, 3 March 1999

Green means greener ...

What works well ... ?

Two types of buildings perform particularly well for their users:

1 Technologically complex, and often deep-plan, buildings which demanded a lot from their management - and got it.

2 Simpler, often shallow plan, buildings designed deliberately to reduce the management requirements.

Sadly, many buildings we survey fall into a third category - those which demand more than their management is prepared or able to give.

These are particularly common in the public sector, in which the business case for more management is particularly hard to justify.

Usability works at three levels ...

Background contexts

1. preferably situations where people need to intervene to change things only occasionally, with predictable “normal” or “default” states which they can utilise habitually, and, for the most part, forget about;

Speed of response

2. opportunities to act quickly to make corrections or interventions if conditions alter;

Interfaces

3. the ability to carry out interventions quickly and effectively.

Good usability is the effective combination of all three to meet the user’s goals in particular circumstances.

Because more attention is given by designers to user interfaces in well-defined contexts (eg. the layout of a kitchen where user behaviour is relatively predictable), good usability is normally associated more with point 3 (the interfaces) than with 1 and 2 (background contexts and speed of response).

Usability means things which are ...

- preferably **intuitively obvious** to use without undue recourse to instructions {“affordances”);
- **easy to operate**, otherwise people may take an easier or more convenient route;
- operate as **close to the point of need** as possible, which may vary with time and the user;
- **work effectively**, with sufficient **fine control** to give the required level of adjustment;
- give **instant tangible feedback** (eg a click) to indicate to the user that the device has operated;
- give **feedback to show that the intended effect has occurred**;
- take into **account occasional use** - people may forget basic actions (eg phone diversion) if they don’t use frequently

Rules of thumb #1

- Interior layouts with desks largely perpendicular to windows.

i- Careful attention to minimising glare by means of light shelves, overhangs, splayed reveals, recessed windows etc..

- Local controls which are easy to use and understand, readily accessible, and take account of both daylight availability and workstation layout.

- Blinds which were easy to operate, provided effective adjustment, and needed to be fully closed only in exceptional circumstances, not routinely.

- Interior furnishings which are relatively light in colour.

- VDUs where people can move screens away from locations which are vulnerable to glare.

from Bordass W, Heasman T, Leaman A and Perry M Daylight use in open-plan offices: The opportunities and the fantasies, CIBSE Lighting Conference May 1994

Rules of thumb #2

- Circulation lighting which is low-energy and well controlled. If people obtain daylight and views as they move around the building, they are less likely to put the lights on when they arrived at their workspaces.

- Occupants who were well-informed about the systems, preferably intuitively, but otherwise by management.

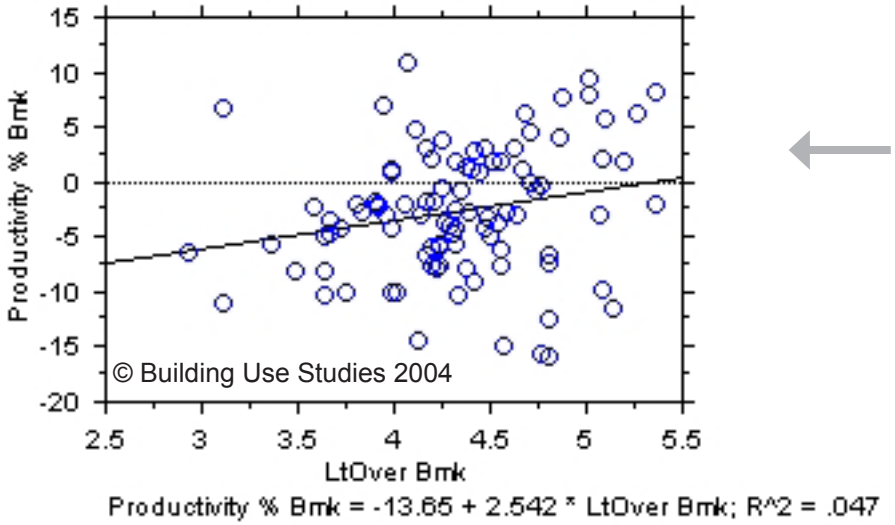
- Some local control over uplighters or task lighting in some circumstances.

- Any problems which arose were dealt with promptly and effectively.

- Opportunities to “tune” systems easily to respond to requirements.

from Bordass W, Heasman T, Leaman A and Perry M Daylight use in open-plan offices: The opportunities and the fantasies, CIBSE Lighting Conference May 1994

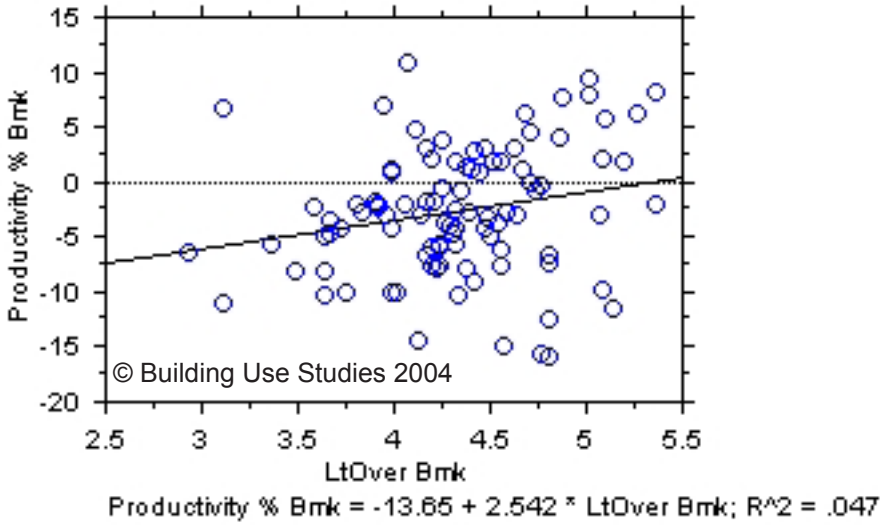
Lighting and perceived productivity



Lighting overall by Perceived productivity : UK dataset :
(p=0.0343).

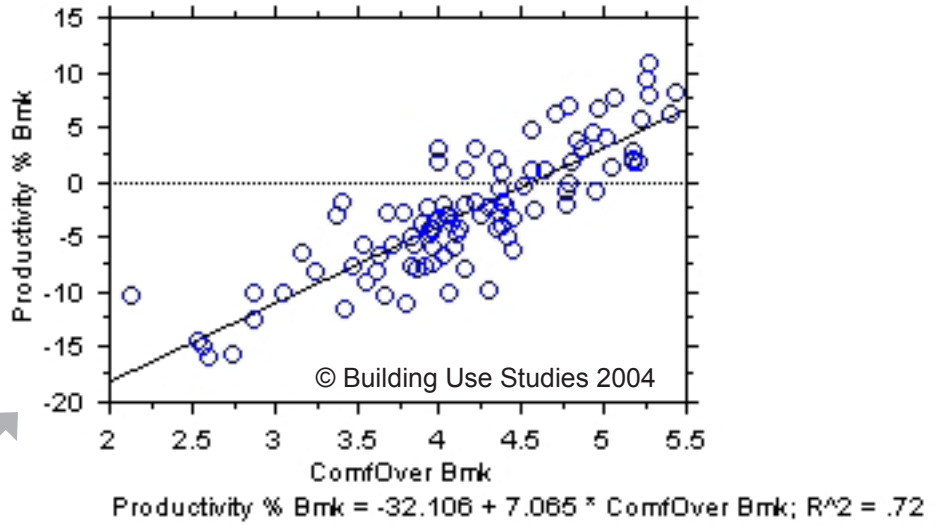
When lighting overall and perceived productivity ratings are plotted there is a weak but slightly significant relationship for the whole UK dataset …

Lighting and perceived productivity



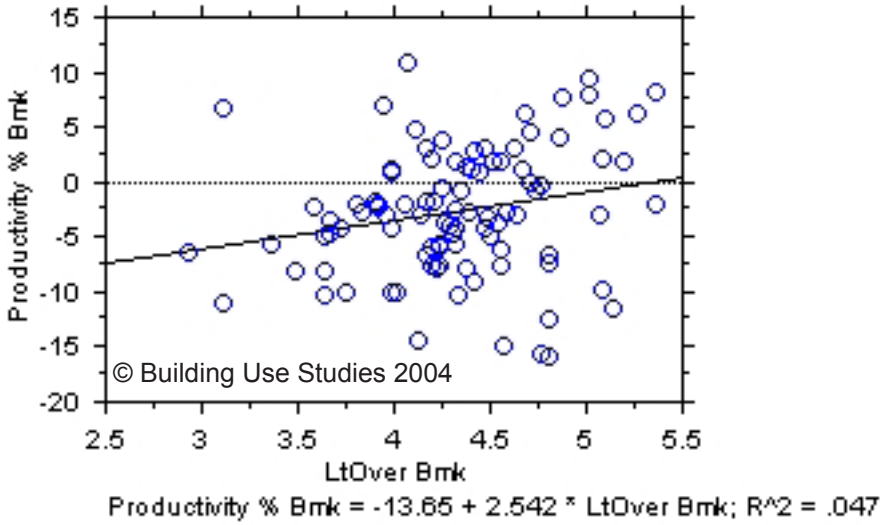
Lighting overall by Perceived productivity : UK dataset : (p=0.0343).

… but comfort overall and perceived productivity relationships are strongly signficant and …



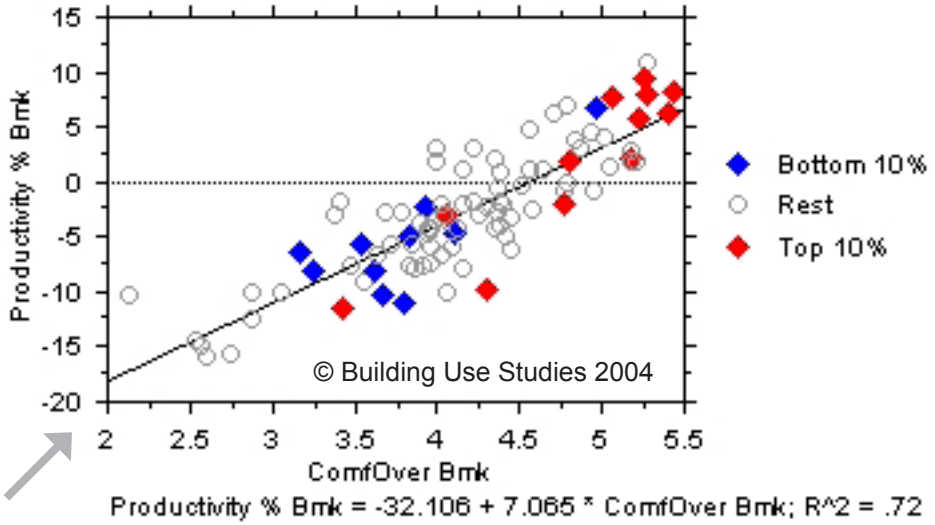
Overall comfort by perceived productivity: UK dataset : Strong and significant relationship (p=<0.0001).
Overall comfort includes heating, cooling, lighting, ventilation and noise.
Split by top 10% and bottom 10% on Lighting Overall

Lighting and perceived productivity



Lighting overall by Perceived productivity : UK dataset : (p=0.0343).

1. Best and worst lighting scores tend to follow high and low productivity scores. However … 2. There are always counter examples (i.e. a good lighting rating amongst lower productivity ratings (1 in 3 chance) and a bad lighting rating amongst higher productivity ratings (1 in 10 chance)



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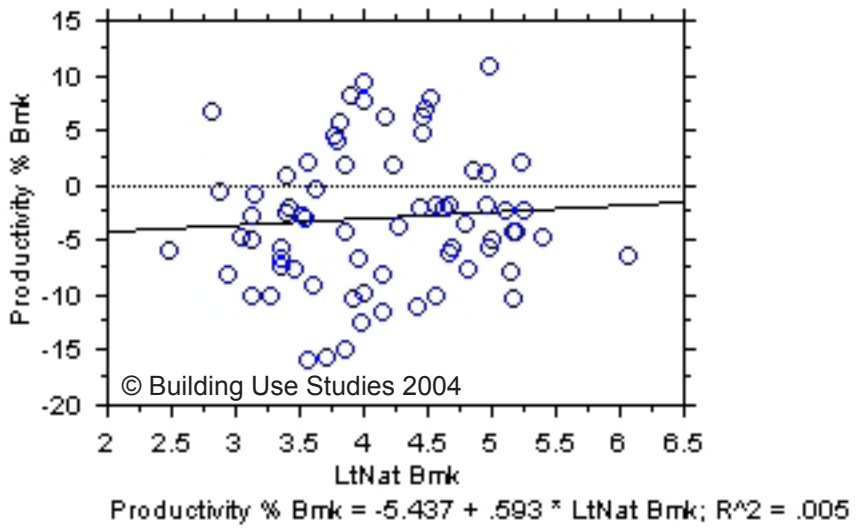
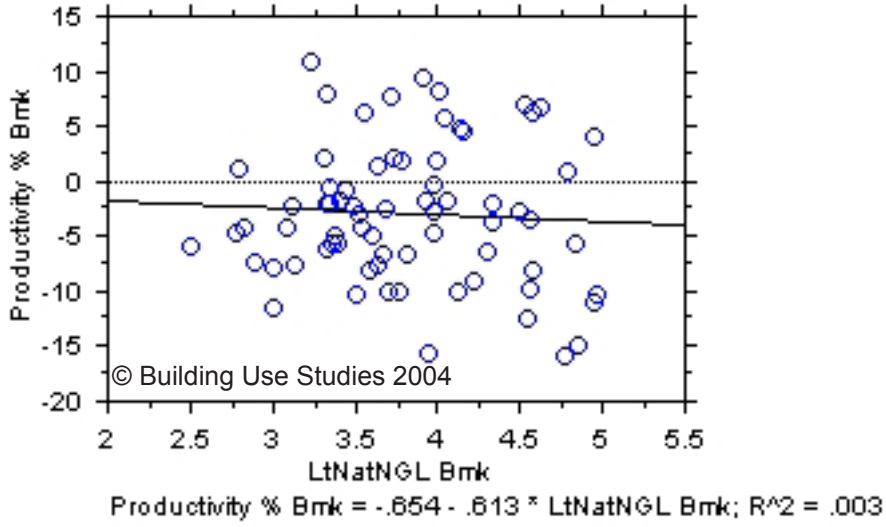
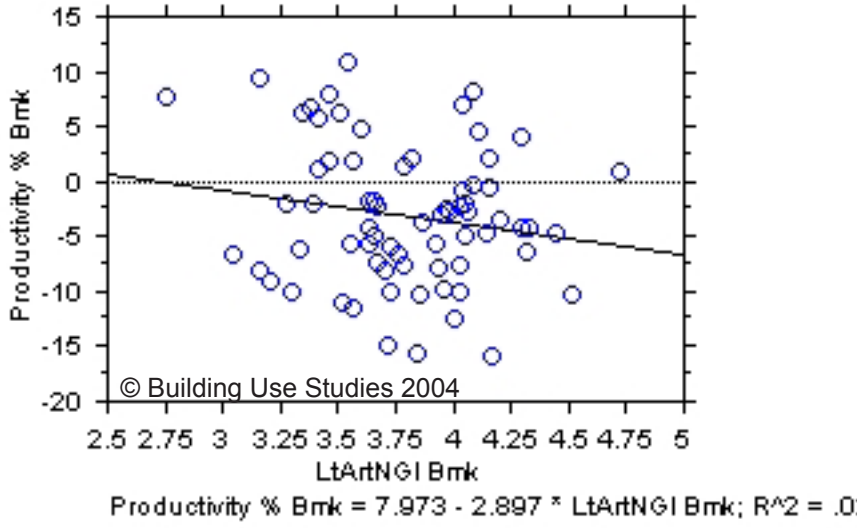
Lighting and perceived productivity 2



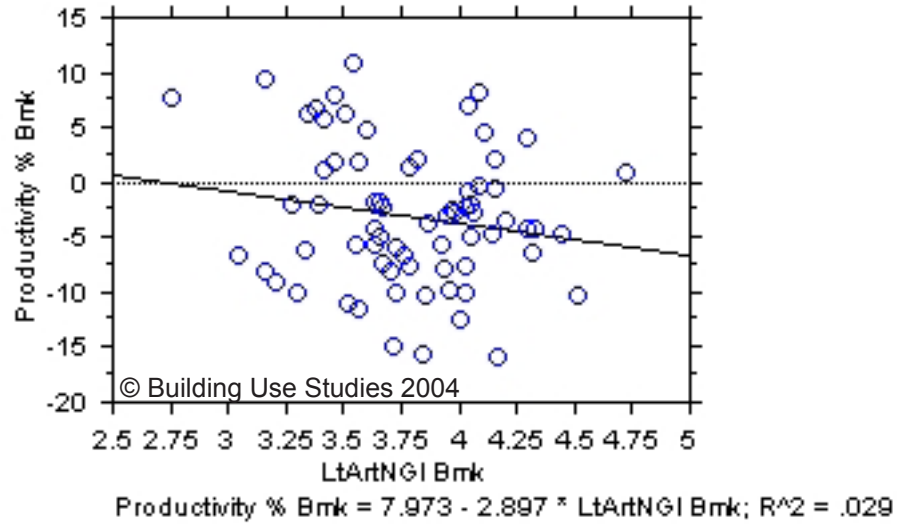
Productivity % Bmk = -5.437 + .593 * LtNat Bmk; R^2 = .005



Productivity % Bmk = -.654 - .613 * LtNatNGL Bmk; R^2 = .003



Productivity % Bmk = 7.973 - 2.897 * LtArtNGI Bmk; R^2 = .0



Productivity % Bmk = 7.973 - 2.897 * LtArtNGI Bmk; R^2 = .029

LtNat/LtArt 1=Too little; 7=Too much.

LtNatNgl/LtArtNgl 1=No glare; 7=Too much glare