An intelligent approach to occupant satisfaction using feedback

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INTRODUCTION

Much design and construction is technology-driven - especially where advanced technology aims to solve environmental, user and management problems for the occupiers. However:

- system designers can make assumptions (often over-simplified) about real-world operating conditions which eventually turn out to be misplaced;
- individual systems may potentially work well by themselves but can be poorly integrated with others;
- systems are often not installed or programmed as the designers had intended, and can be very difficult to put right once a building is occupied;
- user interfaces do not suit the requirements of management, operators and users;
- operators are often poorly informed and trained; and
- changes in the use of the building can undermine their performance.

Technologies are often sold as 'fit-and-forget', but often turn out to be 'fit-and-manage-the-consequences'. And management often resorts to by-passing the design features!

HOW CAN WE IMPROVE THIS SITUATION?

We will get better results if we can make follow-through from construction into operation routine in any project, improving handover and aftercare, understanding performance in use, and feeding the results back into design. This means more monitoring, more open sharing of data, and greater willingness to admit to mistakes. Fewer problems will then become embedded, as we will devote more attention to avoiding them during design, specification, construction, completion, fit-out, handover and initial use.

We can also be cleverer about occupant satisfaction, looking more at consequences for the users and a little less at the technology itself. If we can understand more about what users like and dislike - and particularly what affects health and productivity (as this has the biggest effects on overall costs and benefits) - it becomes easier to target design and management resources; in particular to remove the sources of dissatisfaction.

BUILDINGS IN GENERAL

How much dissatisfaction is there? The Building Use Studies (BUS) question on overall comfort is on a 7-point scale from 1 = Unsatisfactory to 7 = Satisfactory. If scores between 1 and 3 represent dissatisfaction, then Figure 1 plots its incidence for 103 UK buildings recently surveyed, mostly offices. Overall, 35% of respondents are classed as dissatisfied. However, in about one-quarter of the buildings 35-40% of occupants are dissatisfied; and about one-third of the buildings rate even worse. Even in the best buildings (and some of these are exceptionally good) at least 1 in 10 of their occupants is dissatisfied.

[Figure 1 here: Caption : Occupant dissatisfaction levels (Vertical axis: Percentage of buildings; Bottom axis: Percentage of staff dissatisfied with comfort conditions overall).]

On more specific aspects of the indoor environment, dissatisfaction is greatest for thermal comfort, then ventilation, then lighting, almost always in that order. In the past, dissatisfaction with noise came fourth in the list (when BUS started these surveys in 1985, some people thought noise should not be included at all). However, in some modern environments, noise has become the greatest cause of dissatisfaction.

When the data are split by ventilation type, the most dissatisfied occupants are found in naturally ventilated buildings, then air conditioned, then mixed-mode. Split by sector, public sector buildings rate worse than private ones (in which FM budgets tend to be higher). So will a mixed-mode, private-sector building satisfy occupants best? It all depends on how the building suits the requirement, and how well it has been briefed, designed, built and managed.

BUILDINGS IN PARTICULAR

Few buildings fit stereotypes based on averages: you have to look at the individual case to know what to do. For example, in an office surveyed recently, overall dissatisfaction levels were low (9%), putting it in the top 3% of the dataset - an unusually good result for a deep-plan, air conditioned building. For such a good result, we would expect self-assessed productivity to be plus 5-10% (the UK average is minus 3%). However, the result was a bit lower at plus 4%. Could there be a specific reason? The detailed questions showed excellent thermal comfort and noise ratings - but some bad sun and sky glare problems. It turned out that the shading had been omitted to save money, against the design team's recommendations. The "saving" was about £ 300 per workstation - less than what a percentage point loss in productivity would actually cost the occupier each and every year.

MAKING THINGS BETTER

Knowledge of actual performance will help to avoid similar howlers in the future. For an occupant:

- Thermal comfort is the most vital 'driver'. It is the main reason why many of the buildings with really high dissatisfaction scores tend to be naturally-ventilated - excessive peak temperatures being the main trigger.
- On the other hand, if you look at the buildings with the least dissatisfaction, naturally-ventilated and mixed-mode buildings predominate: acceptable conditions with high levels of perceived control can suit people more than better conditions with no control.
- Where discomfort occurs from time to time, perceived control becomes particularly important to occupants: if they cannot influence things, productivity declines. This holds for heating, cooling, ventilation, noise and glare, but is not statistically significant for lighting. Occupant control is the very thing that 'intelligent' systems often try to supplant. If the occupants are not compensated with extremely good internal conditions (which are much harder to achieve than many think) they will complain.
- The best buildings tend to be those where perceived needs are met quickly - it does not matter whether this is automatically, through the occupants' ability to make changes, or through a very pro-active, helpful and rapidly-responding facilities help desk. 'Smart' technology can help, but it can also get in the way: viz the unpopularity with users of call centres and remote answering services.
- Occupants are extremely practical. They want to get on with their own tasks with as little hassle as possible. First and foremost, the building must not get in the way of what they need to do - great if it looks good as well, but (contrary to the views of some architects and clients) a signature building with a "wow factor" may impress visitors and passers-by, but can be resented by permanent staff if it doesn't work well enough too.

MAKING PERFORMANCE VISIBLE

Building performance studies were pioneered in the 1960s at Strathclyde University in the UK and in the USA at Berkeley. Since then they have been carried on mostly in universities,

research associations and in private consultancies, and were either not published, were one-off investigations without consistent methodologies, were published only if the results were good (e.g. energy demonstration projects in the 1980s) or were distilled into general conclusions only. An exception is the *Journal's* Probe series which ran from 1995 to 2002 - when government co-funding sadly stopped.

There is much to be gained by making performance more visible both to the project team and more widely. This can lead to:

- Better understanding what contributes to performance.
- Insights into the consequences for occupants.
- Encouraging everyone involved to do their bit in striving to achieve better performance, with clear "ownership" of the problems involved (e.g. for design, or for management).

To help all this along, we need:

- A clear language to describe building performance, covering both physical and human aspects.
- Readily-available, reliable, cost-effective methods which people can trust and use.
- Incentives to clients, designers, builders, occupiers and service providers to measure and improve performance - and we don't just mean KPIs.

Two good things to start with are:

- Occupant questionnaires, as occupants can tell you a lot very quickly. *(People are often the best measuring instruments - they are just harder to calibrate - G Raw, ex-BRE).*
- Energy and and carbon emissions, because an energy survey also gives a lot of insight into design, construction, installation, commissioning, documentation, control, maintenance and management; and you speak to lots of different people.

MAKING FEEDBACK ROUTINE

The next step is to move routine feedback and follow-through from the fringe to the mainstream. At last there are signs that this is beginning to happen, with growing interest and activity by design practices.

In our experience, acting on routine feedback from buildings is the true hallmark of intelligence - not second-guessing how buildings ought to perform, or how people are supposed to behave; but learning from what actually happens. The gap between expectation and reality is often quite large, no matter how well honed the models and simulations. This is usually because the all-other-things-being-equal assumptions in models never quite capture the complexity of what actually happens in buildings with their overlapping human and technical systems. This is a methodological flaw which artificial intelligence has never overcome, despite all the good intentions.

The most intelligent strategy is to get real and target unhappy occupants. Even a modest across-the-board reduction of 10% in the average dissatisfaction levels shown in Figure 1 would reap huge benefits. More care in meeting needs, with speedier response times also means better economic and environmental performance, owing to the virtuous design and management circles which tend to be present in the buildings in which performance monitoring and feedback occurs. A win-win-win if ever there was one!

SOME RECENT PROGRESS

[Figure 2 here; Caption: Screenshot from the opening page of the Feedback Portfolio website. Most of the text is clickable, providing more detailed information.]

We are just finishing a PII project which has been looking at how to make feedback on building performance and follow-through from design and construction into occupancy and aftercare routine for procuring clients and their design and building teams. Its products will include:

- An awareness-raising document, to be published by the Office of Government Commerce.
- A website [www.usablebuildings.co.uk/fp/index,html] with a portfolio of techniques which can be used. The prototype (see figure 2) currently contains ten UK methods including Probe, the BRE method for feedback in the first year of occupancy (including a handover procedure), and Soft Landings, an adapted Plan of Work which includes not only improved handover, feedback and aftercare but what design and building teams, clients and management must do to get ready, from Day 1.

Methods included in the Portfolio have been tried out by the projects' User Group in a series of building evaluation projects. Results will be made available in a Results Portfolio, hosted by the Usable Buildings Trust, a new charity devoted to the promotion and dissemination of quality assured findings on building performance.

The European Commission's new Energy Performance of Buildings Directive, which requires building energy certificates which take actual energy performance into account to the extent possible, is also likely to trigger more interest in feedback, and not necessarily just on energy. The Europrosper project [www.europrosper.org] has developed prototype software for preparing hypothetical energy certificates for offices largely automatically, based on the earlier CIBSE TM22 energy reporting methods used in Probe. This has also prompted BUS to develop a short 20-question occupant survey for use alongside energy certificates.

Figure 1 Occupant dissatisfaction levels

Graphics folder File Fig1.tif

Editor: Please add text to graphic as follows:

Vertical axis: "Percentage of buildings";
Bottom axis: "Percentage of staff dissatisfied with comfort conditions overall".
Anywhere suitable: "Source: Building Use Studies 2004"

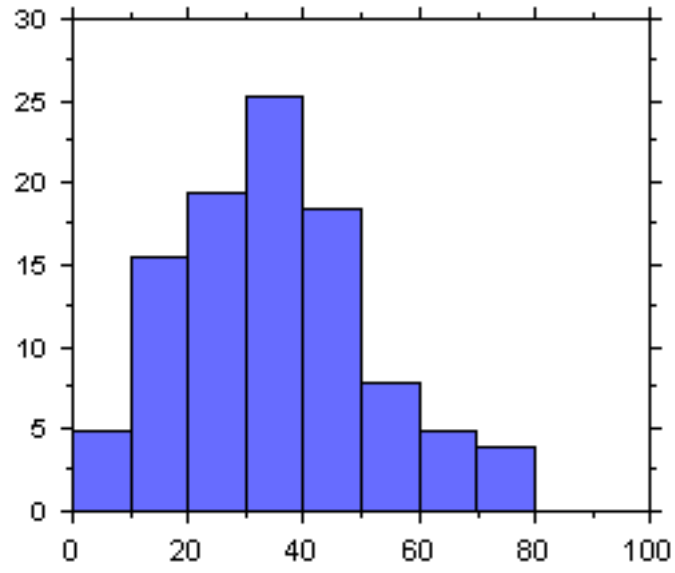

Figure 2: Screenshot from the opening page of the prototype Feedback Portfolio

Graphics folder File Fig2.tif

Editor: Please add text to graphic as follows:

Anywhere suitable 1.: Source: www.usablebuildings.co.uk/fp/index.html

Anywhere suitable 2.. Most of the text is clickable, providing more detailed information.