In August 2013 we held a week-long online discussion between UK-GBC members about the BUS (Building Use Studies) methodology. 

Want to add to the conversation? The comments that came out of the discussion have been added to Pinpoint and can be read here. [http://pinpoint.ukgbc.org/resource/7770](http://pinpoint.ukgbc.org/resource/7770) This document is a summary of the wide ranging debate on the methodology.

What is the BUS (Building Use Studies) methodology?

The BUS methodology is a well established, simple and standardised questionnaire to benchmark levels of occupant satisfaction within buildings. Results can be used to create solutions to improve the occupant experience and optimise building performance.

Over 45 key variables are evaluated covering aspects such as thermal comfort, ventilation, indoor air quality, lighting, personal control, noise, space, design, and image. Twelve summary variables provide a snapshot of the overall building performance. The non-domestic database has around 650 buildings from 17 countries and the domestic database has around 50 projects (over 1100 domestic premises) from the UK. You can find out more about the BUS methodology at [www.busmethodology.org.uk](http://www.busmethodology.org.uk)

Why carry out a Building Use Study?

Buildings exist to meet the needs of the people that use them and designers, contractors, developers, operators and managers have a responsibility to ensure that buildings meet these requirements. To achieve this, it is critical that occupants that are using buildings are listened to, adjustments are made and lessons are learned for future projects.

The introduction of carbon reduction targets and the need to reduce consumption, as well as costs and

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1 See contributors end the end of this document.
limited resources means the energy performance of buildings is critical. Closing the energy ‘performance gap’ is essential to helping us meet these targets and needs. However, energy performance evaluation cannot be completed in isolation, and it is imperative that it is evaluated together with an understanding of occupant satisfaction. Only where these two aspects are combined will it be possible to create true ‘Building Performance Evaluation’ and gain the feedback needed to meet the needs of the users and clients.

Occupant Satisfaction Evaluation using the BUS methodology can also provide a diagnosis of ongoing problems, for example:

- tracking down the sources of dissatisfaction with air quality which may require detailed measurement of volatile organic compounds (VOCs);
- as part of a wider portfolio of measures (e.g. in the Probe project where the BUS methodology was used in conjunction with detailed energy measurement and air tightness tests);
- as a component of PhD research to examine occupant behaviour in housing; or
- bringing building evaluation assessment to a broader church as in the Technology Strategy Board (TSB) BPE project.

Managers and Directors from within buildings, estates, facilities management and sustainability departments are more frequently using the new understandings in occupant satisfaction to inform strategic decisions. E.g. estate rationalisation and relocation.

The BUS methodology is “the most consistent and thorough tool currently available, and it should be commended to clients as a minimum standard for assessing occupant satisfaction. It is very useful that it takes account of quantitative/qualitative feedback.” Bennetts Associates

How does the BUS methodology process work

The BUS methodology is licensed to trained and experienced partners who are selected to guide and advise users on the survey process as well as analyse results.

Surveys can be print or internet based. The best results are obtained when all questions are asked, but certain questions can be omitted as it is recognised that some are not appropriate in all situations. The survey contains up to 45 questions and seeks views on aspects such as:

- Thermal comfort and ventilation
- Lighting and noise
- Personal control
- Space, design, image and needs

In commercial buildings occupants are asked about their perceived productivity, health, response to problems, effect on behaviour and how they travel to the building. In domestic buildings, occupants are asked about their lifestyle, health, environmental issues and utilities costs. The non-domestic workplace survey is currently available in ten languages and domestic and transient surveys are available in English only.

The summary results give a quick view of overall building performance. Results for each question are reported using statistical tables, graphs and plots. Slider graphics with Red, Amber, Green (RAG) markers are used for ease of interpretation and anonymous narrative comments are provided. The BUS methodology partner can then help the client/end user to interpret these results in detail and put them in to context for the building.

BUS for housing was first developed in 2004 with assistance from Professor Fionn Stevenson. The

2 http://www.busmethodology.org.uk/process/
housing questionnaire is different due to the range of challenges housing poses and the difficulty in collecting data. It has some cross over questions from the non-domestic version to allow comparability, however it is shorter, more practical and as easy to administer, the Lancaster CoHousing is an example of the BUS methodology in use. Housing work is still relatively new and therefore the experiences of fieldworkers carrying out the first generation of surveys are of great importance.

**Benchmarking**

There are currently five non-domestic benchmarks (UK, NZ, International, Canada and Australia), a UK housing benchmark and a UK schools benchmark. Benchmarking is based on real data from other buildings but it is not the main aim of the survey. It is made as robust and understandable as possible, based upon past empirical results.

It quickly allows identification of how each variable performs within the building against the benchmark dataset, allowing quick identification of ‘above’ or ‘below’ average characteristics. It also allows the buildings performance to be rated overall against the benchmark dataset for a summary, comfort, satisfaction and forgiveness index.

Benchmarking takes you into the territory of large-scale databases and the associated methodological and resourcing issues that go with them. Whilst it can be helpful to compare performance, attention can shift from what respondents are actually saying about the building, to debates about the ratings given, the differences between the traffic light scores, sample sizes, respondents’ abilities to recall the reasons why they gave the answer they did and so on. These are all legitimate concerns and are the subject of constant enquiry and refinement and, crucially, compromise.

**Generic questionnaires**

Standard questionnaires are used (with minimal adjustments) because this is helpful with the benchmarking but is also much more affordable. For example, in non-domestic buildings, questions are asked about conditions for respondents at “their normal desk or work space”. Most people will normally work at one desk, but some may have two ‘normal’ work spaces or more, such as classrooms, laboratories or courtrooms. Sometimes, two questionnaires have to be administered: one for the office desk or one for the laboratory, for example. As circumstances differ widely there is an element of improvisation involved. On the other hand, if the questionnaire is tailored too closely to a particular building or building type, you lose the ability to compare with others. What do you do, for instance, if you are studying a fire station, and you have no other fire stations in the dataset? Do you produce a one-off special for fire stations, or use the generic questionnaire, noting carefully the context and the comments made. The BUS methodology approach is to do the latter.

**Validation**

This question is most frequently asked, especially from academic researchers who have to justify their work against strict criteria, often derived from experimental science. The BUS methodology is an example of real-world research. To validate in the strictest sense you need to show that the results from one sample survey tally with those from another survey in the same building, so that there is consistency and ‘robustness’. To do this properly is expensive and generally there are not the resources available. However, repeat surveys have been carried out (using the BUS methodology) and published as in the Elizabeth Fry Building, University of East Anglia (which was first studied in 1998 in the Probe series of post-occupancy studies and revisited in 2011) and the Charities Aid Foundation: Project Revisit. In all cases the consistency over time is remarkable.

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3 Lancaster CoHousing Project: post occupancy evaluation, Green Building Journal 24, Summer 2013
4 Colin Robson, Real World Research
5 Bordass W. and Leaman A., Test Of Time, CIBSE Journal, March 2012, pp 30-36
6 Bunn R., Charities Aid Foundation: Project Revisit, Delta t, BSRIA, October, 2008, pp 6-10
**When to consider implementing BUS**

For new build or refurbishment projects, buildings need to be designed with input from the users at the beginning of a project to ensure that functionality meets their requirements.

Designers can use BUS as a tool to learn what went right or wrong on previous projects and feed this valuable information into their designs next time.

For owners, developers and estate managers it can be used as a tool to provide valuable learning for better briefing and procurement of future buildings. It can provide crucial feedback on existing assets, to ensure the building works better for the people and the business.

For contractors it can be used as a validation tool as part of Building Performance Evaluation (BPE) or POE to ensure the building is operating as intended and help validate commissioning. Occupant Satisfaction is embedded in the approach of soft landings and is a requirement for credits such as Man04 in BREEAM.

Facilities Management teams can use BUS to highlight critical areas of focus in the building. This could create KPIs and provide a method to improve performance of the building and improve client relationships.

It can be useful to carry out surveys before occupant’s transition to a new space. For example, Catholic Aid for Overseas Development (CAFOD) conducted continuous engagement and user satisfaction surveys at their previous premises. When relocating to their new premises, designed by Black Architecture, not only did they implement user centred design but continued with the engagement process and user surveys for three years post occupation. This has demonstrated that user satisfaction has improved in the first 18 months of occupation.

Before and after surveys can also be extremely useful for major refurbishments and implementation of new technologies to understand the perception and reaction of the occupants.

**Optimising and interpreting results**

**Capturing additional data**

Undertaking BUS methodology surveys in isolation is useful, but potentially a missed opportunity. To understand and appreciate the user and their building environment, context is important to understand what should be done to improve the conditions. The following information could add value (depending on the project scope) to the interpretation of data:

- Internal and external temperature, ambient barometric pressure and humidity (air quality if possible);
- Ambient noise levels internally and externally;
- Weather conditions – rain / sun/ cloud / wind;
- Day of the week;
- Timing relating to the calendar of the organisation e.g. end of term/end of quarter/financial year;
- Record any data regarding the specific conditions on the day the survey was taken which are out of the ordinary;
- Other salient factors creating organisational stability or change; and
- Tracking BUS results over time e.g. throughout the year and /or at the same time year of year to understand transient users perspective such as shoppers and hotel guests

Carrying out a survey on site and understanding the surrounding context is hugely valuable to assimilate and understand the reason for respondent’s answers.
In some building types, such as schools, building users move around frequently and it becomes more difficult to interpret BUS methodology results and relate them to the spatial and physical characteristics of individual teaching spaces. This can be countered by appending a floor plan to the questionnaire and asking users to mark their usual locations.

**Independent evaluator**
One participants view was having an independent organisation carrying out the survey can be beneficial to the quality of results received. It reassures respondents that their feedback will remain anonymous and the evaluator is on hand to answer questions from the participants. They also felt that if a BUS methodology Partner was not on hand to deliver this service directly, it can be beneficial for respondents to hand back completed questionnaires in a sealed envelope, to maintain anonymity and ensure honest responses are given.

**Role of designers**
Another participant felt there was a question as to whether the designers of buildings, or indeed anyone closely associated with a building’s procurement, can conduct BUS surveys objectively. They felt that vested interests won’t be an issue if the results validate the designers’ beliefs, but they are an issue when the results are unexpected and disappointing.
A study of two buildings that had very similar CO2, humidity and temperature readings has shown that occupants who are happy and take pride in the design of the building they occupy appear to be more tolerant of issues such as air quality, temperature and comfort compared with those who have frustrations about the fundamental design of the building.

**Benefits**
The BUS methodology is the most extensively used survey of building occupants and is well developed having been used since 1985 when it was first introduced as part of a large-sample study of ‘sick’ buildings.

The BUS methodology is simple to understand and administer, reasonably economical to carry out, but with enough substance to be used in wider and more detailed work if necessary. The graphics, summary variables and indices provided are easy to interpret for non-technical clients. It can become a good source of data for learning lessons to help inform future building design.

**Challenges and areas for consideration**

**Resource implications**
One participants experience was that capturing all the relevant data and transcribing results into the pro-forma for a paper BUS survey for a non-domestic building with a large number of occupants is very time consuming. However, evaluators recognise the benefits outweigh the time invested. In some situations an online survey can be more appropriate and this significantly reduces the time for the evaluator as the responses are automatically entered into the pro-forma.

**Responses**
Getting a good response rate is not easy, but guidance and training can boost responses. The providers recognise this and are looking at options to get a higher response rate particularly for internet based surveys.

**Buy in**
One participant has experienced resistance to carrying out occupant satisfaction surveys from human resources managers due to concerns that a satisfaction survey is misconstrued as an opportunity to criticise the current building without providing constructive feedback. This could be solved once the BUS methodology becomes more widely known and understood.
Some of the most useful discussions can often be with building managers, estate managers and sustainability managers/directors where they are seeing the benefit of understanding how the occupants perceive the building to inform decisions moving forward (e.g. estate rationalisation, moving to a new building).

**Language**
One of the participants felt that the language of some of the questions could be clearer. For example, ‘too cold’ to ‘too hot’ implies a pejorative or discomfort. Using scales similar to the ASHRAE thermal sensation scale of ‘cold’ to ‘hot’ or the Nicol scale of ‘cooler’ to ‘warmer’ (in response to ‘how would you prefer to feel?’), would be less ambiguous, as it should not be taken for granted that the preferred temperature is a neutral. Noise and light measurements would benefit from the same treatment, with the exception that sunlight in more communal areas is considered as a positive. Language and scales used to measure a user’s view can sometimes create ambiguity, however this is a trade off with the need to have a generic questionnaire suitable for different building types.

**Additional criterion**
One participant felt it would be helpful to understand a users’ attitude towards the perceived feeling of ‘connection’ to the outdoors which will influence servicing strategies and affect comfort levels.

**Availability of case studies**
It would be helpful to have access to more case studies which have feedback on the actions building operators have undertaken in response to past survey results – and whether those actions can be linked to subsequent performance improvements or investments, i.e. can BUS drive actual improvements?

**Next steps**
The on-going challenge now for the industry is to truly understand how occupants perceive the buildings they occupy, feeding these lessons back into the design and operation process and continuing to grow the useful database of building use studies.

**Thank you to the following who contributed to this discussion:**

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