

## **The Management and Use of Knowledge from Building Evaluations**

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### **ABSTRACT**

The School of Architecture at Victoria University of Wellington has developed a generic process of participatory building evaluation. The process is equally useful for any type and size of facility, for design proposals in preparation and for buildings in use. The reasons for an organisation to undertake evaluations or to offer evaluation services differ. Evaluation programmes and services are usually geared to long term benefits while one off evaluations promote both immediate and long term action. The long term value to an organisation of an evaluation programme or of offering evaluation services may be considerably enhanced by an operational database which can be used to influence building acquisition, operational policy and portfolio management. However, it is our experience that the development of a knowledge database is not a straightforward matter.

This paper discusses the issues of developing a database of the outcomes of building evaluations and reviews a number of approaches. The form and content of such databases and their management and use are considered. The paper describes the development of a knowledge database for an international banking organisation based on the information gained from participatory building evaluation activities. The process of information collection and the database structure are described. Methods of analysis are explained and some of the findings of these analyses presented. The paper concludes by outlining some of the difficulties of maintaining on-line databases and by cautioning that, to date, they have not been well used in building design or management practice.

#### **Key Words**

building evaluation; knowledge databases; building acquisition and operational policy, building portfolio management; participation

### **Building Evaluations and Corporate Knowledge**

Evaluation is a logical component of designing and managing facilities. To make informed decisions for the future it is necessary to take account of the present and review the past. Traditionally facilities management concerns have been with portfolio and asset management, and the maintenance and operation of facilities. However there is growing pressure from building users that such management concerns are not addressing their interests. The serried ranks of clerks have now all but disappeared. They



have been replaced by a highly qualified, highly mobile workforce who now expects and demands good working conditions and quality surroundings.

"Above all, the success of modern office development depends upon the management of change. Change is everywhere - in equipment, in technology, in what Americans call 'churn', the proportion of the workforce which changes workplace each year" (Duffy, 1988).

The rate of churn in US offices has been estimated as high as 60%. Change in the modern workplace is having its profoundest effects on the way people use and operate in buildings and how organisations and their managers respond to the challenges of change. Currently, facilities managers are aware that they lack the means to address this phenomenon. However, recognition that there is a need to adopt processes which are responsive to the changing needs of both the individual and the organisation is leading some organisations to offer evaluation services as part of their building resource management responsibilities and to develop programmes of building evaluation.

There are a variety of purposes, objectives and contexts in which evaluation services and programmes of building evaluation may operate, including:

- **Fixing**: evaluating occupied buildings for finetuning purposes, or troubleshooting in buildings with ongoing performance problems, including the use of specialist skills for focused studies of particular issues
- **Selecting**: assisting the selection of accommodation from a range of existing facilities either for purchase or rental
- **Programming**: as an aid to the briefing and design of new and refurbished facilities
- **Developing Knowledge**: as a means of gathering information to form a corporate knowledge base

In this paper we place emphasis on 'developing knowledge' as a purpose. By 'knowledge' we are referring to the knowledge gained from evaluating the perceived performance of buildings in use and not project knowledge, that is knowledge gained from the process of procuring buildings.

In the short term programmes of building evaluation derive benefits for the purposes of fixing, selecting and programming. They also have good client relationship benefits, promoting improved communications and showing a "caring face". To promote longer term benefits, some organisations are looking to develop knowledge bases about evaluation outcomes, and through them guidance and advisory material for themselves and their clients. Long term, building evaluation programmes can be used to accumulate evaluation data, translating it for future use. They can assist building owner and tenant organisations to enhance their corporate knowledge about issues of building ownership and management and they can inform their portfolio and asset management activities.

Our experience from a range of activities is that those who are involved in evaluations are enthusiastic about the process and its outcomes. They find evaluations personally informative and rewarding and want to do more. The short term benefits of action to do with fixing, selecting or programming are seen by those involved as extremely valuable.

However, the written records of the evaluation activities, the evaluation reports, are seen as of only limited specific value. There is serious concern about how an effective knowledge database of the outcomes of evaluations can be developed, operated and maintained.

This paper discusses the development of programmes of building evaluation. We begin by describing our own experiences with developing a programme of building evaluation and make brief reference to some of the other programmes and evaluation activities of which we have knowledge. We then reflect specifically on the creation of knowledge bases from the information gained through evaluation. We finish by describing a case study of the development of a knowledge database for an international banking organisation based on the information gained from participatory building evaluation activities.

### **The generic evaluation process**

The evaluation process we have developed (Kernohan et al, 1992) is based on the very simple idea of asking people what they know about a building. The process gives opportunities for different groups representing users and providers to focus on a building and determine action about physical and social issues in the building that concern them. Each group engages in a three part process. They meet to agree the procedure for the evaluation. They then walk through the facility identifying and commenting on issues that are important to them. Finally, they meet to discuss and negotiate recommendations about those issues. We call the three parts:

- Introductory Meeting
- Touring Interview
- Review Meeting

These three events are the core of the generic process that recur at every evaluation. While the core of the process is present in each evaluation event, each evaluation is itself unique. Each has its own pattern and is designed to respond to its own purpose, objectives and context - fixing, selecting, programming, developing knowledge. The core of the generic evaluation process is therefore surrounded by other events which are directed specifically to the different building and management purposes. So, we have a generic evaluation process that is used in various ways in different contexts, for different purposes throughout the lifetime of a building.

### *The Participants*

Evaluation by this means calls for three sets of participants:

- Participant Groups who evaluate the building. They represent the different interests in a building.
- Facilitators who assist participants to make their evaluations.
- Managers who authorize the evaluation.

The participants are the building evaluators. Participant Groups represent the different interests in a building. By interests we mean that a group has a common involvement with the building. Thus, for instance, an occupant group evaluating a research facility may be drawn from the laboratory scientists in the building. The interests typically include those of occupants, visitors, owners, tenant organizations, makers, traders, and maintainers. Each participant group evaluates the building from its point of view.

Facilitators do not evaluate the building. They support the participants in their evaluation. Facilitators have a neutral role throughout. Usually there are two or three facilitators. Both participants and facilitators may play a part in initiating evaluations and monitoring outcomes, but their prime activity is the evaluation itself. It is only participants and facilitators who are concerned with the on-site activities of the generic evaluation process.

Managers are not normally concerned with the on-site activities, although they may be represented in a participant group. Their role is administrative and supportive. They may initiate, approve and authorize an evaluation, help determine its purpose and take responsibility for ensuring their is action on the outcomes and for the ongoing management of that action.

### **Programmes of Building Evaluation**

The development of programmes of building evaluation has been led by the public sector and research organizations wishing to display accountability in the performance of non-financial activities. Through the 1980s we had the support and collaboration of the New Zealand Ministry of Works and Development (MWD) in developing our evaluation process. However, since 1984, New Zealand has seen a dramatic shift of Government organisations away from public service roles into quasi (if not actual) commercial operations. Their accountability is focused on financial returns. Such organisations, in the past, have not wished to be at the forefront of user participation in building evaluation.

The question facing commercial organizations is who will pay for assembling information which is not of immediate interest to its clients - and which is therefore not of immediate commercial value? This kind of activity would be consistent with the mandate of a government department such as the former New Zealand Ministry of Works and Development, charged with responsibility for ensuring quality in government building programmes. But private organizations (and many public ones) have no such mandate, and can only undertake tasks of short term interest for which clients will pay. Longer term interests such as those involving knowledge databases will have to be addressed in commercial terms and will depend upon projections of the growth and profitability of the evaluation business. The long term interests could of course be served if a major client could be persuaded to fund the development of a database to benefit its own building programme - as do Health and Welfare Canada and the California Department of Corrections. The very different demands that short and long term interests make on the evaluation effort have yet to be successfully integrated in fully commercial design and construction enterprises.

### *Other Evaluation Programmes*

A number of other programmes of evaluation have grown out of developments in what is known as Post Occupancy Evaluation (POE). POE simply means the evaluation of a building after it has been occupied. A number of organisations in both the private and public sector, particularly in the U.S., offer POE services. POE is now a discipline of its own. According to Preiser, Rabinowitz and White (1988) POE is a phase in the building process that follows the sequence of planning, programming, design, construction and occupancy of a building. In this model, its emphasis is clearly retrospective - comparison with previously stated norms preferably from the original design brief or programme, rather than pro-active. POE is seen as informing regulation and guidance documentation rather than offering methods or direct advice to designers and managers on how they should access and use knowledge about people and buildings. Through POE there is developing a growing knowledge base about the relationships of people and buildings. However, there remains a concern that the major issue of providing information that is directly useable by building designers, managers and users is not being addressed. POE information often remains as reports and documents inaccessible to those who can most benefit from their findings.

### **Knowledge bases**

Organisations contemplating development of a database from the outcomes of building evaluation activities must consider not only its form and content but also its ongoing management. Issues of information transfer are highly problematic. Structuring information and making it accessible to different users is a specialist skill. Maintaining and upgrading the information is a different but equally specialist skill. Reviews of some of the evaluation reports we have produced have shown that the way information is recorded and presented is important to its usefulness in future situations. For example the knowledge that the users of a particular building did not like the quality of the floor covering is of limited value. What may be needed is why they did not like the quality of the floor covering; the uses to which it is normally put; the reason it was specified in the first place; and some technical details about its specification, performance and maintenance. Ensuring that this quality and depth of information is collected consistently during evaluation processes requires specialist skills for accumulating and translating that information into a form for future use.

The use to which a database may be put can take many forms. The US Army Corp of Engineers very thorough Design Guide Publication series offers one model, as does similar guidance documentation produced by the Department of Health and Social Security and the Scottish Home and Health Department's Estatecode in the UK. The production, publication and dissemination of a guidance series is a major undertaking for any organisation and is difficult to keep up to date without a significant commitment of resources. Another model is to integrate evaluation data into a computerised information system similar to that developed by the Australian Department of Housing and Construction (Bycroft et al, 1987). Its system, called POETIC, used a customised form of standard database software for the analysis, sorting, storage and retrieval of information generated by evaluation.

Reports from evaluations conducted using our generic process have been used to categorise evaluation outcomes to reflect the concerns of the interest groups involved:

- Policy and Brief (owner, client)
- Design and Construction (designers, builders)
- Operation and Maintenance (occupants, managers, maintainers)
- Fine tuning (all groups)

The information provided in this way was also cross-referenced to a general building documentation and classification system to provide a further means for disseminating information from evaluations. We have however found generally that on-line databases are difficult to maintain and are not well used in design or management practice.

We are therefore wary of giving too much priority to the development of knowledge databases. For us, action is the prime purpose of and motivation for the evaluation activities we have described. Nevertheless, we believe that action should include recording and reporting what occurred at each evaluation event. While such reports are useful of themselves in promoting action, the reports collectively form part of our corporate knowledge about people, organisations and buildings. We have not used such reports for significant database analysis or interpretation nor to move towards the development of guideline documentation for specific building types or situations. Effective analysis and interpretation may in time provide such long term organisational and general knowledge benefits as our Case Study will show. However, our principal use of the data gathered from evaluation has been to assist development of what we have called a Checklist of Factors.

### *Checklists*

The Checklist is a framework which begins to describe the relationship of people, organisations and buildings. The Centre for Building Performance Research has developed a system of weighted scales for scoring the quality of office buildings based on building evaluation experience. This system, now being marketed by a private sector client as 'Building Quality Assessment' (BQA) enables property owners to measure and compare the quality of buildings for investment purposes (Beddek and Kernohan, 1990; Bruhns and Isaacs, 1992). In Canada, the International Centre for Facilities in Ottawa has pioneered development of 'Serviceability Scales' for use by Public Works Canada to rate the quality of office facilities used by Canadian government departments. The Serviceability Scales are also used to assist departments to specify their generic requirements for office accommodation (Davis et al, in press). A version of the Serviceability Scales is in the process of ballot for publication by the American Society for Testing and Materials (ASTM).

Comprehensive systems such as Serviceability Scales and BQA are costly and time-consuming to develop, but can become reliable and efficient instruments.

A checklist should never be used as the sole means of evaluating a building. Used as part of participatory evaluations, it can aid comprehensive evaluation by complementing participatory activities and helping to ensure that recommendations for action are stated

as part of an understanding of the wider building context. Checklists can provide a structure and format for a consistent recording of the outcomes of evaluations, a basic requirement for any knowledge database and for its management.

### **A Knowledge Database Pilot Case Study**

Our case study describes the development of a methodology for the ongoing evaluation and development of branch bank designs on behalf of a major international banking group. They wished to evaluate the effectiveness and efficiency of a series of branch banks refurbished under a recently developed new corporate image. They wanted to finetune the newly refurbished banks but also to develop a longer term understanding of 'successes and failures' to inform the overall refurbishment programme planned over the next three years.

The generic evaluation process provided the principal method for gathering data about perceptions of the branch banks' performance. In the pilot study, four branch banks were evaluated. In summary, two facilitators visited each branch for one day for on-site activities. A further three days were required for preparation and reporting activities by the facilitators. The role of the facilitators was to gather information from participant groups representing the different interests in each branch bank, recording comments verbatim (where possible). Participant groups included:

<u>Customers:</u>	Old; Young; Private; Business
<u>Bank employees:</u>	Ledger; Loan; Customer Services; Reception; Tellers; and Management (each as a separate group) and ;
<u>Support personnel:</u>	Cleaners

Meetings of the facilitators with each participant group were set up on the hour, in a room separate from the main public or staff areas. An interview room which could be dedicated to the evaluation for the entire day proved to be the most suitable. In each meeting, the facilitators introduced themselves, explained the purpose of the evaluation, and indicated that the outcome of the evaluation would affect both the short term needs of the subject bank and the longer term refurbishment programme. To assist the facilitators in the first branch, a "Prompt Sheet" was prepared, based on the experience of previous evaluation experiences.

Emphasis was given to the fact that it was the participants who were to evaluate the branch by identifying issues of concern to them and forming recommendations about how those issues might be addressed in both the short and long term. The facilitators elicited information by letting participants talk about whatever they perceived to be important about the place. Standard open-ended questions were used as prompts. Leading or directed questions were avoided. Thus the lack of mention of a particular issue in one branch which was a major topic of discussion in another had its own significance. In most cases, the facilitators and the participant group left the interview room to briefly tour the branch to ensure all relevant issues were recorded.

## Database Structure

At the completion of the work with the participant groups, the facilitators recorded any further detail and took photographs of relevance to any issues raised. After each visit, the facilitators transcribed the comments of all groups under a set of predetermined headings. The headings were developed and have been tested on the four case studies. They are built on the use of behaviour settings (Le Compte, 1974) and their spatial and physical attributes and characteristics of the Settings, called 'Factors'.

The database is presently structured as follows:

- Level 1 **SETTING**: physical location where particular activities are carried out. Branches have been divided into 19 behaviour settings as in Table 1.
- Level 2 **FACTOR**: attributes of the setting that affect the way these activities are carried out. Settings have been divided into 5 Factors as in Table 2.
- Level 3 **LOCATION**: the branch identifier.

SETTING	
1) Exterior	10) Toilets
2) Entrance	11) Staff Room
3) Manager's Office	12) Circulation Spaces
4) Front of Counter 1	13) Services 1
5) Back of Counter 1	14) Staff
6) Desk 1	15) Customer
7) Counter 2	16) Special Area
8) Other desk Areas	17) Storage & Stationery Cupboard
9) Interview room/area	18) Overall

**Table I** Settings

FACTOR
1) <u>Spatial quality</u> - physical dimensions, "feel" of the space etc
2) <u>Environmental quality</u> - noise, light, temperature, wind, etc
3) <u>Furnishing</u> - desks, chairs, computers, filing cabinets etc
4) <u>Fittings &amp; fixtures</u> - doors, door handles, partitions etc
5) <u>Finishes</u> - paint, wall paper, rag-rolling etc

**Table II** Factors

In addition to issues relating to the three levels, comments of direct relevance to the management of the branch and the overall management of the bank are recorded. These comments, categorised under Additional Classifications, include:

- General: the general operations of the branch and support functions (eg, towels being changed in washrooms)
- Refurbishment: Refurbishment is a stressful process. Comments here offer suggestions as to how to reduce the impact of refurbishment activity on the bank customers and staff.
- Cleaning: how easy it is to clean the branch, especially if it remains occupied during refurbishment?



Some further additions to the headings may be required as more branches are assessed. The transcribed comments from the evaluation activities at each branch were returned to that branch for checking by all participants. The facilitators returned a week or so after each on-site evaluation to discuss any issues further. The final on-site activity for the facilitators was to confirm what action would be taken as a result of the participants' recommendations. Off-site the checked, transcribed comments and recommendations were loaded into the text database for additional analysis. At present the database is a highly structured collection of text which can be readily converted to a form suitable for a database programme for any computer system. The intention was not to dazzle users with complex computer wizardry, but rather to provide a sophisticated structure which could be readily accessed using standard text tools.

### *Numerical Analysis*

A preliminary analysis of the database is presented to demonstrate a benefits of recording the results from multiple branch evaluations in a database structure. The full text of all the recorded comments and recommendations is held in the database. The number of comments made by Setting and Factor at one branch bank and in total for the four branches are graphed in Figures 1 and 2.

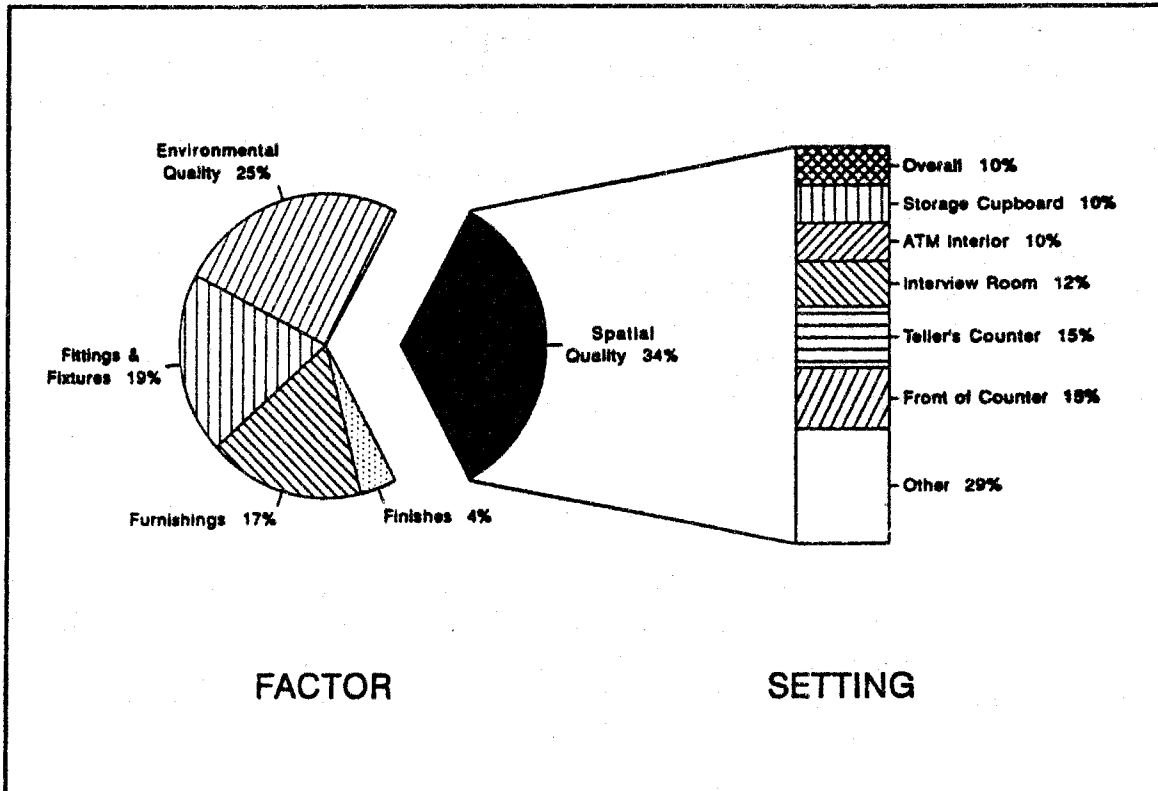
This is a simple count of comments. There is no differentiation between positive and negative comments. As such it is of value in identifying Settings and Factors that appear to be subject to greater interest. It may be interesting to note that a Setting in one branch may be of particular concern while in another it may not even be mentioned.

The present approach also implies an equal weighting to every comment, whereas in many cases this would not be correct. However, the analysis does provide a quick overview of the issues of importance in any one branch or across a setting. A summary of the proportion of comments by setting and location, ordered by proportion, is also available as standard output.

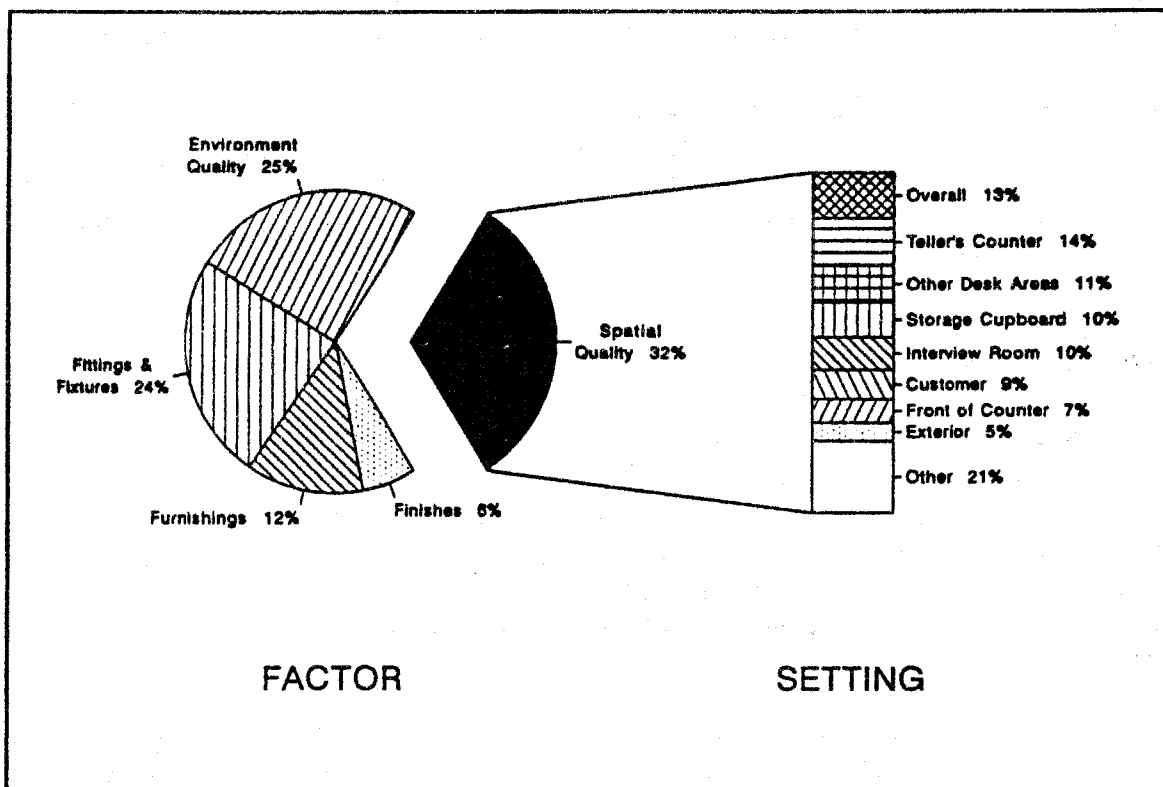
### *Specific Issue Analysis*

The database can now be manipulated to provide a variety of analyses. For instance, only four settings received over 10% of the comments by count in any branch. One example where all five Factors were important was the area behind the teller counters. The database permits ready access to the recorded data, and from there into useful knowledge for modification or redesign. In this example, the space available for movement and for locating required support equipment was immediately seen to need immediate action.

There are also opportunities for further detailed analyses to be undertaken to meet specific needs or purposes. The advantage of the computerised full text database is that source comments can be accessed and grouped as appropriate to a given issue or query. For example, it is possible within the database structure with simple text searching tools to explore such questions as: Are children's play areas of interest to the users of the branches? Is adequate storage for stationary available where it is required?



**Figure 1** Comments by Setting & Factor at one branch bank



**Figure 2** Comments by Setting & Factor total for four branches

## **Concluding Comment**

We are wary of giving too much priority to the development of knowledge databases of the outcomes of building evaluations. Generally on-line databases are difficult to maintain and are not well used in building design or management practice. To operate them requires a commitment not only to structuring and maintaining a database but to implementing a comprehensive programme of evaluations and to developing useful, appropriate and consistent methods of data gathering. Who will pay for assembling information that is not of immediate interest to clients and which is therefore not of immediate commercial value?

One route, advocated here, is to invoke and maximise both the short term (fixing, selecting and/or programming) and long term (developing knowledge) benefits to be gained from evaluation activities and services. In the pilot case study the principal aim of the evaluation programme was to enable inhouse staff to develop sufficient evaluation skills to enable the bank to monitor the implementation of its refurbishment programme within its new corporate image. The monitoring involves using our generic evaluation method to help finetune the refurbished branches as an immediate short term benefit to the bank's customers and staff. However, the generic evaluation process has also allowed a knowledge database to be developed. This database will provide longer term benefits to the refurbishment programme, hopefully ensuring 'successes' are repeated, and providing information of value to the generation of further refurbishment designs and the next corporate image.

It is worth noting that, at present, both the undertaking of evaluations and the development of the database are constrained by the availability of resources. Faced with limited human resources, the needs of refurbishment have a higher priority than the benefits of on-going evaluation and feedback to improve design.

While some large government organisations have funded the development of knowledge databases to benefit their own building programmes, it is difficult to identify contexts in which such databases would be developed for such singular purposes. This paper advises caution, but indicates that where there are multiple benefits to be gained from evaluation activities then one of the longer term benefits can be the development of knowledge databases tailored to the needs of client organisations. Indeed, it is where multiple benefits are to be gained that the development of such databases can become both economical and effective. This paper has indicated that such databases need be neither sophisticated or complex to be useful and that they can be developed and maintained as part of normal operational reporting procedures.

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