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USING FEEDBACK FROM END USERS TO IMPROVE DESIGN OF PRODUCT SERVICE SYSTEMS

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1. Introduction

The importance of recognizing user needs and incorporating them in the design of products and services is widely recognized. This is true not only for products but also for buildings and services. In public building design and refurbishment, consultation often takes place at the start to determine the requirements from the public users. These requirements can be helpful in making major decisions at the conceptual design stage. This paper argues that the detailed feedback from the public on the results of a library refurbishment /redesign project can also be helpful in influencing future designs.

The paper focuses on public feedback from a refurbishment of the public library in Lancaster, UK. The library redesign was part of a nationwide Community Libraries Programme. The Lancaster library was the first of three library refurbishment projects in the Lancashire region. Public consultation took place prior to the library redesign and was a requirement of the project funding. After refurbishment and reopening, a larger post-occupancy consultation took place using an innovative consultation method. During this consultation, sections of the library were still being modified and services were being adapted, this allowed user comments to have a direct impact on aspects of the redesign of the library and an input into the design of other libraries in the area.

The innovative post-occupancy consultation method was supported by technology developed by the Voice Your View Project (vYv). This paper will begin with a discussion on participatory design. It will also present an overview of the Lancaster Library case study, including a description of the vYv digital kiosk developed for the consultation. Central to the paper is an analysis of the comments collected from the Lancaster Library case study. The analysis will highlight changes to the library directly resulting from the post-occupancy consultation, the potential use of these comments in future library redesigns and also highlight how vYv can be positioned as tool to be utilised in the front-end of public building design.

2. Participation in design of public buildings

There is recognition within building design that an open process of communication can positively impact a design process [Gray and Hughes 2001], [Reich et al. 1996]. In their study on participatory design, Reich et al. [Reich et al. 1996] hold that knowledge is essentially social in nature and participation allows both shared and contested perspectives to be expressed with the user playing an important and active role in the design process. The vYv project has worked from the premise that the users of a public space knows it best. Transforming tacit user knowledge into explicit knowledge can inform designers and improve future designs of buildings and the services they house.

In his study of environmental psychology and the design process, [Stokols 1978] defined the role of a building user as either a 'reactive' or an 'active' subject. The reactive subject transacts with an environment in an evaluative and responsive manner while the active subject interprets and operates on an environment. With 'active' participation, there is two-way communication between public users and decision-makers. This ongoing process must take place within a 'climate of reciprocity' with communicants open to interaction and the possibility of mutual impact [Pasquali 2003]. Abelson and Gauvin [Abelson and Gauvin 2006] have identified the ability to influence a design process and change the content of a particular project, as a key motivating factor for users to engage in participation. Innes and Booher [Innes and Booher 2004] have identified multiple motivating factors for public participation which includes identifying public preferences and improving decisions by incorporating user and local knowledge. However, with long leadtimes between public consultation and the opening of new buildings, the impact of public comment is often unrecognised.

McAloone and Andreasen [McAloone and Andreasen 2004] discuss the importance of design of a 'Product Service System' rather than design of artefacts. This concept takes into account the socio-technical utility and behavioural problematic. In the context of the case study of the Lancaster Library, the redesign involved not only changes to the building structure but also to the layout of departments within the library, a change of how services were delivered and the opening of the library to new services such as room rental for public meetings and events. Thus, this can be considered a 'System Innovation' involving changes in concept, infrastructure and user learning [McAloone and Andreasen 2004]. The reaction of users to such changes is likely to be dramatic as they adjust to new environments and new services delivered.

This project allowed the collection of detailed feedback from endusers at the point of reopening the public library when final configuration of services and furnishings were still being determined. The reaction of the endusers to the redesign and the changes suggested allowed users to become active participants in the redesign process itself.

3. Lancaster library user consultation method

As previously discussed, the library users in Lancaster UK were consulted prior to the refurbishment project on their local library and their views taken into consideration. Over a six week period following the reopening of the refurbished Lancaster library, there was a further consultation to determine the reaction to the newly refurbished building and reconfigured services. This consultation used a combination of traditional methods (comment book and feedback postcards) and an innovative consultation device developed as part of the voiceYourview (vYv) project. A vYv kiosk within the library was used to collect user and public comments on the redesign of the library. The kiosk featured the familiar device of a traditional telephone handset. The handset was mounted on a project box with a large arcade-game style red button. To generate interest in user participation, a screen displaying recent comments and collective responses formed part of the kiosk [Whittle et al. 2010]. The speech to text processing used to enable this display was done through the web-based server Spinvox and comments were tagged and categorised though the use of the web-based Natural Language Processor, WMatrix.

On the display screen, five key themes were represented by coloured and moving orbs. The size of the orb indicated the number of comments within the theme, while the colours indicated the sentiment of the majority of comments relating to the theme (red for negative, green for positive and yellow for neutral). The display intended to attract interest and prompt further comments. Comments gathered through the vYv kiosk, postcard distribution and library comments book resulted in a total of 904 comments from 600 individuals. The vYv kiosk attracted 543 comments which was more than the combined total of comments left using the postcards (225) or in the library comment book (226). This showed the display screen and kiosk was effective in attracting comments on the refurbishment from the library users.

4. Design analysis of comments

In order to determine the usefulness of the comments to designers, a sample of 560 comments were subsequently analysed to categorise them in terms of their relevance to designers. This manual

analysis was initially based on the design themes selected in consultation with the library staff and printed on the prompted postcards. During this analysis, compound comments were often split at sentence and clause level in order to specify the range of design themes that could be found in a single comment. This resulted in a total of 790 discrete comments which were then categorised into the most appropriate corresponding theme.

During this analysis, a total of twelve themes were identified in the data. Seven of these themes were consistent with the original prompted postcard themes, these were: *shelving*, *library stock and books*, *IT facilities*, *lighting*, *furniture*, *layout* and *colour scheme*. Five further themes were either adapted or created to reflect the content of the user comments. A merged theme of *staff and services* was created to include comments on staff, opening hours and the self-service issuing of library stock. The pre-determined category of *anything else* was renamed *general design* due to the nature of the comments falling within this category. The three new categories of *carpet*, *CDs and DVDs* and *children's area* were added in order to reflect the large number of user comments that addressed these themes. Surprisingly, among the prompted themes: *actual (library) building* and *individual rooms* received no user comments. This was despite the library redesign resulting in major changes to both individual rooms and the library building itself.

The need to exclude, adapt and create new comment categories indicated that library users did not always comment on expected topics and were able to raise new design issues. The new issues raised were very localized to where the kiosk device was situated and show the importance of the positioning of an input device when seeking feedback. Using the vYv kiosk allowed users to provide detailed comments on these issues to provide feedback to the design team.

In the design-focused analysis comments were also identified as being either 'positive' or 'critical' based on a two point Likert scale. Critical comments were not only comments that appeared negative in sentiment, but also comments that suggested a solution or an alternation to an identified design issue resulting from the library redesign. These 'critical' comments could also be considered 'actionable' [Whittle et al. 2010] as they offered suggestions on how to improve the library.

5. Content of user comments

A summary of the twelve themes identified through the design-focused analysis of the user comments is presented in Table 1. From a total of 790 discrete comments 66% were found to be critical (including suggested improvements). This suggests that although the refurbishment of the library was largely complete, the consultation provoked an appetite for further improvements that went beyond those made in the redesign. However, 270 of these comments (34%) were related to aspects of the library service – these included comments relating to *library stock and books*, *staff and services*, *CDs and DVDs* and *PCs*. Of these, 81% of comments were critical or included suggested improvements. This indicated that users were not only concerned with the physical design of the space, but also with adapting library services to suit their needs. This response also suggests that user comments can be used to have a continuous impact on service design, and that the impact of the consultation need not be limited to space redesign and changes that have already taken place.

In terms of comment sentiment, the theme *Library Layout* received the highest proportion of positive comments with 78.6% of comments being positive (with no improvement suggested). In contrast, only 14% of the comments falling within the *Furniture and Seating* category could be classed as positive and 86% of the comments within this theme were either negative or suggested further improvements.

The *Children's Area* also attracted a high number of critical comments (87.5%) which can be attributed to the fact that this area was previously located in a separate room. After the refurbishment, it was located in the main open-plan foyer which proved unpopular with parents and library users. These include the following comments:

I don't think the new children's library is very child friendly. If I had very young children I would be worried about 1. my baby crying and disturbing other users; 2. toddlers seeing all the space and wanting to run amok. It is not cosy or self contained.

Table 1. Analysis of sample comments from vYv consultation

Theme	No. of Comments	Positive Comments %	Critical Comments %
Overall	790	33	66
Library Stock and Books	126	5.5	94.5
General Design	119	49	51
Staff and Service	93	39	61
Layout	89	78.6	21.4
Children's Area	64	12.5	87.5
Colour Schemes/Walls	54	31.5	68.5
Furniture and Seating	49	14	86
Shelving	49	37	63
Lighting	45	64	36
PCs	33	24	76
Carpet	31	26	74
CDs and DVDs	18	6	94

The comment categories of *Colour Schemes/Walls* and *Carpets* were particularly interesting as they represented new design features that were being applied to all Lancashire Libraries under the Community Libraries Programme. Comments relating to both these categories could provide valuable user information for the design of other libraries. 68.5% of the comments relating to *Colour Schemes/Walls* were critical and included suggested improvements. This includes the following examples:

Walls stark, too white.

Walls are too white. Maybe murals by local artists would give off an atmosphere of community spirit and co-operation.

Following on from the comments and suggestions the library's design team addressed the issue by working with a local arts group to add decorative and transferable vinyl writing on the walls as well as use the wall space to host a number of exhibitions featuring the work of local artists.

74% of the comments relating to Carpets were critical. The carpet was viewed as having a very 'busy' black and white newsprint type pattern which had a 'dizzying' effect on some library users. The number of comments on this topic was unexpected by the design team. Their interpretation was that a design scheme which had worked in smaller scale library spaces may not be suitable in a larger context.

The comments were useful in supporting the detailed design of the services and tailoring the space to suit the end users. Although it was not practical to apply major changes to the Lancaster library at the post-occupancy stage, the comments served as a 'lessons learned' and had the potential to affect design of future refurbishments.

6. Usefulness of comments to design team

The comments collected as part of the post-occupancy evaluation were fed back to the design team and project management in a workshop with the vYv project members. The designers found the comments useful and the suggested changes could be incorporated in other projects in the same programme. They noted that some of the critical comments about the children's area and furnishings had been addressed subsequent to the consultation. It was noted that comments were localised to the area where the kiosk and other feedback mechanisms were located and to the services provided in these locations. This meant that other areas of the library and services which were not immediately apparent (additional room hire for example) did not receive any comments, despite major changes. This reveals the need for careful siting of feedback mechanisms in order to get a full range of comments on the design and services provided.

It was noted that users regarded the refurbished library in a 'holistic' way as a Product Service System and commented on the building, services, staff and furnishings using the mechanisms provided. It can be seen that any one of these aspects affects their overall impression of the redesign. For example,

changes to the way books were issued and less interaction with staff affected the way the whole project was perceived. There was a concern in the design team that comments originated mainly from the previous users of the library. A certain resistance to change was noted in the comments about library stock and the way the books were issued. The aim of the refurbishment was also to capture new users for the library. This would include young people attending music events and local organisations using the meeting rooms. Due to the location of the devices and the timing of the comment capture, the views of these new library users were not captured adequately. These observations would emphasise the importance of feedback mechanisms being accessible to all users of a product service system.

7. Conclusions and further work

This paper reported on the vYv consultation in Lancaster Library which made use of an innovative 'intelligent kiosk' as a method of user comment collection. Although the consultation took place post-occupancy, the paper suggested that the comment data gathered through the vYv consultation provided information that directly led to further service and space design changes in the library and also provided valuable information for the redesign of other Lancashire libraries within the Community Libraries Programme. The automated collection of comments from the public generated useful observations. These were found to be very localised to the services and design features in the specific area where the feedback device was sited. To get a balanced feedback would require several such devices targeted at different user groups.

Definitions of user participation and consultation indicate a possible active and transformative role for user consultation within building design. Participation was deemed 'active' if users could contribute knowledge, opinion and critique that could positively transform and impact a design process. This design-focused analysis of the user comments provided both actionable information and insight into design features of the library that would have otherwise been left unaddressed. The comments gathered by the consultation also allowed staff to respond to and act upon user concerns and indicated that library users took an active interest in continuing improvements to the library. Some minor design changes were made as a result of post-occupancy user comments. They also provided a useful input to the redesign of other libraries in the same programme. The content of the comments suggested that the vYv method of consultation could be effectively deployed in the front-end stage of building design and provide a means to implement an active and transformative form of user consultation in the design process. Further case-study research would be needed in order to validate these findings. Future work would also include how to provide feedback from design team and service providers to inform users of how their comments have been addressed in changes to designs and services.

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