THE ROLE OF AN ECO DESIGN ADVISOR - HOW EFFECTIVE HAS IT BEEN?

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ABSTRACT

In response to the need for independent and personalised advice on sustainable design solutions from an easily accessible and centralised source, the Eco Design Advisor (EDA) scheme was initiated by BRANZ Ltd. The Eco Design Advisors are building experts working from the council and provide up to two hours of free eco-design advice on residential building projects. The three primary functions of the EDA are to: provide a free supply of information; actively promote, network and facilitate between clients, the design and construction industry and stakeholders; and to act as a feedback loop enabling the industry to respond to the growing needs of homeowners. The scheme was piloted in three New Zealand councils. Ten more councils are intending to join the scheme in mid 2007.

A core part of this project is to evaluate the success of this scheme and its impact on the values and long-term behaviours of the homeowners and designers. There are two main components to this scheme's evaluation: a survey measuring the attitude and behaviour changes, and an environmental-based building assessment tool to determine the significance of the design changes made. This paper describes the extensive evaluation of the scheme's pilot and presents the trends emerging from these results.

KEYWORDS

Effectiveness; overcoming barriers; sustainable design; behaviour change.

INTRODUCTION

The aim of the Eco Design Advisor project is to improve the skill level of the local industry and to increase the uptake of sustainable design practices in New Zealand houses. The Eco Design Advisor project achieves this by providing free customised face-to-face advice on housing-related sustainability matters to prospective home builders, renovators and other community members. The Advisors fulfil three primary functions:

- A free supply of customised information reducing the barrier to solution implementation;
- Facilitation between client, designer and trades-people;
- Networking between stakeholders and sustainability resources.

The Advisors work from the council premises and via site visits (based on the concept of a mobile bank lending manager) in close co-operation with local councils providing advice on request at various design stages.

International research has consistently shown that provision of printed or other mass information alone does not have any measurable effect on actual sustainability behaviour change (McKenzie-Mohr, 2006). In order to be effective, intervention measures need to be carefully researched and designed using multiple and targeted tools. This Eco Design Advisor (EDA) project builds on previous extensive research and incorporates a number of coordinated well targeted intervention measures.

The concept of the EDA is based on findings of the Foundation for Research, Science and Technology (FRST) funded BRANZ research project on Zero and Low Energy Houses (ZALEH) (Stoecklein,

Zhao, Christie, & Skumatz, 2005; Stoecklein, 2005) as well as work by Victoria University of Wellington on homeowner sustainability decision-making processes during the building process (Christie, 2005). The research identified three main obstacles for making sustainable building choices:

1. There is no point in the design and building process at which the home builder is directly prompted to make decisions about sustainability.
2. Even if the home builder is interested in sustainability, there is a lack of specific technical information and advice on how to implement it.
3. There is a lack of industry expertise and a general reluctance by designers and trades-people to implement sustainability features.

Similar barriers have also been identified by a recent study commissioned by Beacon Pathway on barriers and incentives to sustainable building practices in the Auckland region (Easton, Mead, Trenouth, Fullbrook & Arnold, 2006). For these reasons, the homeowner usually leaves it up to the designer/builder to deal with sustainability design decisions. In these cases, the building generally ends up with the minimum performance levels permitted by legislation. The EDA initiative is designed to address all of these obstacles.

PROJECT EVALUATION

In order to assess whether this scheme has worked as an effective intervention measure, this project includes an extensive evaluation component. A range of measurable success criteria have been developed including quantifiable targets such as:

- Number of client consultations
- Service satisfaction feedback (surveyed)
- Number and type of implemented sustainability technologies
- Sustainability improvement impact
- Perceived value and long-term success
- Marketing/branding success for the EDA programme and participating partners
- Increase of sustainability solutions proactively offered by designers and trades people;

These individual components can be grouped into two areas: a quantitative assessment of the improvements to the built environment and an examination of attitude and behaviour change. Although the EDA's have various types of contact sessions (whether advocacy-, project assistance-, industry-target- or general communications-based) with the industry and public, it was mainly through their one-to-one consultation sessions where a detailed assessment of their direct and indirect influence was examined. The results of these sessions are described following.

IMPROVEMENTS TO THE BUILT ENVIRONMENT

Assessing Environmental Design

The EDA initiative evaluated physically-based indicators to determine their influence on the client's design directly. From this, a gauge of the environmental significance of the longer term 'built-in' features of the design could be estimated, which should result in on-going benefits for the dweller (as well as the environment in general).

The design assessment had three main objectives:

- To determine the number, type and the environmental significance of implemented sustainability technologies within an assessed dwelling;

- To determine the overall sustainability improvement impact of the design being investigated/consulted on;
- To determine at what stage, by what project type and what environmental area the EDA service was typically being use on.

In all longer EDA consultations, records were kept of the design being examined. These design details were based on the issues examined by the BRANZ-developed environmental performance assessment scheme, called the Green Home Scheme (GHS). The GHS assesses a variety of key environmental building design and living issues, providing an overall indication as to the design's environmental merit (Jaques, 1997). It was developed by BRANZ, and has been operational since 1997. Usually, a house of low complexity can be assessed under the scheme within one hour. Due to time constraints on the EDA consultation, a truncated version of the original GHS was used.

The overall environmental performance score is calculated using a three staged process: as it was initially designed; the design including the EDA's recommendations as agreed to by the client; and finally, the as-built design with all the realised changes. This allows comparing the actual (or more accurately, the *intended*) impact of the consultation on the physical building in a very direct and transparent way.

The truncated GHS tool used by the EDAs assesses six building-related thematic areas, each of which has several issues associated with it. In all, 21 eco-issues under these six themes are assessed – making it reasonably comprehensive. The list of the thematic areas and their associated issues are shown in Table 1.

Table 1: (Truncated) Green Home Scheme issues and associated credits

Thematic Area	Credits (%)	Issues examined within a theme	What issue indicates
Overall Thermal Performance	28	Improved insulation levels, room placement, thermal mass, orientation, overheating mitigation methods, other solar design techniques	The ability of the building to maintain a comfortable temperature naturally, all year round.
Appliance resource use	21	Water and space heating energy sourced from environmentally preferred sources or having a higher efficiency than standard.	Overall resource use based on the two resource use 'heavyweights'.
Water Economy	17	Local harvesting of water and improved water management practices	Reliance on reticulated water sources
Site Selection	18	Proximity to key services and solar access potential	Transport efficiency and passive solar potential
Spatial Efficiency	8	Space (area) used per person, based on number of bedrooms	Degree of likely ongoing resource (mainly in terms of energy and materials)
Indoor Air Quality	8	Kitchen and bathroom pollutant management	Health (indoor environment quality) indicator

Each issue has a number of 'credits' associated with it, weighted according to its perceived environmental importance and the level of (buildability- or cost-related) difficulty in achieving it. This weighting is displayed in Table 1 above. Credits range from 1 through to 8 for a single issue, with all issues being based on life cycle thinking where possible. It should be noted that the GHS was developed to ensure that credits had to be 'earned', to minimise the amount of 'greenwash' sometimes associated with these tools (Jaques, 2004). A total number of 78 credits are possible within the

truncated system, if all environmental issues are achieved. In addition to the categories above, a climate footprint indicator is provided, based on the likely energy intensity in operating the building.

As can be seen, energy-related issues (either directly or indirectly) feature highly in the assessment process. Energy use is associated with the thematic areas of overall thermal performance, appliance resource use, site selection, and spatial efficiency.

These environmental performance assessments were evaluated for the more extensive (that is, more than half an hour in duration) consultations. Since these consultations usually involved the consideration of multiple environmental issues, the assessments formed a natural extension to the work the EDA's were carrying out and served as prompts for key issues which may have otherwise been overlooked.

Assessment Results and Analysis

The following findings are a sampling of the results from the truncated GHS assessment.

A. The percentage change in the total number of GHS credits (pre and post consultation).
An EDA consultation resulted in a doubling of the number of credits gained for a particular design, on average. Given that, typically, a design started with an average of 18 credits already (with a maximum of 78 credits possible); this equates to a percentage shift in overall number of credits gained from 23% initially, to 47% after the EDA consultancy session. This suggests that the EDA were significant in their influence over several thematic areas rather than just a discrete few.

B. The absolute change in the total number of credits (pre and post consultation)
An increase of 19 GHS credits (on average) resulted from a consultation with the EDA's. This is very encouraging as it is a considerable amount in a scheme which considers only environmental issues of consequence.

It should be noted that the EDA 'clients' must have already been targeting environmental issues, given they were able to achieve 18 credits at the *start* of the consultation process and the fact they were seeking the EDA's advice in the first place. In previous work undertaken for Beacon Pathways Ltd, a 'run-of-the mill' house (from a sample of 20 randomly selected, recently constructed houses in the greater Auckland region) averages about 10 credits from the full GHS version (Jaques et al, 2005), where there is more opportunity to gain credits because of its more complete nature. Since it is unlikely that environmental-related building practices have changed significantly since the random sample was carried out or there is any reason to believe that houses from different regions are considerably different in their environmental features, its seems that those approaching the EDA's are by their very nature, more pro-active and aware of sustainable design.

C. What 'upgrades' were usually committed, by thematic area.
The most popular upgrades were by far 'thermal performance' followed by (to a considerably lesser degree) 'water economy'. In some ways this is unsurprising given the significance of these issues (repeatedly stressed at all EDA workshops) and their more complete examination within the assessment tool. For example, energy was covered either directly (or indirectly) in three thematic areas – 'overall thermal performance', 'appliance resource use' and 'site selection'.

D. Type of consultation, by project type.
Consultations were grouped into four types of project – new build, renovation, extension and demolition. The representation of each is shown below in Figure 1**Error! Reference source not found.**:

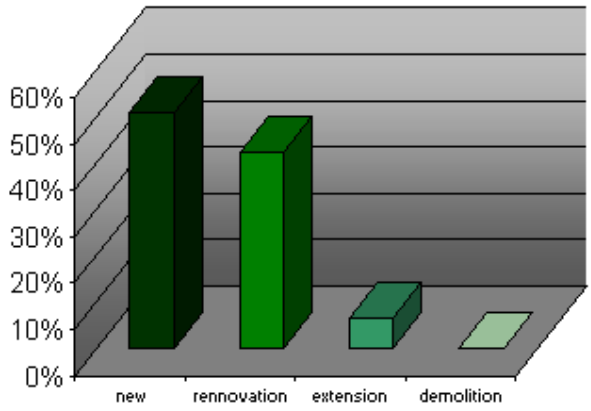

Figure 1: Stage of construction at which the EDA's were approached

As can be seen, by far the most common stages of construction the EDAs were approached for were 'new build' and 'renovation' projects. This is encouraging, given the large number and resources used in these two project types and their corresponding potential for environmental improvement.

ATTITUDE AND BEHAVIOUR CHANGE

Survey Methodology and Development

The purpose of this evaluation was to assess whether the Eco Design Advisor has had an impact on the attitudinal and behavioural responses of designers and homeowners towards environmentally sustainable design. This was carried out by survey.

The survey had four main objectives:

- To assess the relative knowledge gained from the EDA
- To measure any change in attitudes and motivations as a result of meeting with the EDA
- To measure any change in behaviours as a result of meeting with the EDA
- To gain an understanding of the perceived value of the service and future demand

The research design for the evaluation survey was based on a case control method so that changes caused directly by the EDA could be assessed. That is, designers who did not have contact with an EDA were also surveyed, acting as the control group for designers who did see their EDA. The same applied for the homeowner sample. This resulted in four different versions of the survey and two independent variables (IV) over which responses will be matched. The two IVs being whether the respondent has seen the EDA or not, and whether they are a homeowner or designer.

The target population were New Zealand homeowners and designers who were either considering building new or renovating their existing house, or who were involved with residential housing. There are approximately 987,000 homeowner's (67% owner-occupiers) in New Zealand (Palmer, 2006) and the size of the residential design community is estimated to be 4,853 (Statistics New Zealand, 2006).

The sample populations were selected as follows. All designers and homeowners who saw an EDA and who gave consent to be contacted for this future research, were sent a survey. The lists of homeowners and designers who had not seen an EDA in each of the three regions were constructed from building consent applications from each of the three participating councils in the last 3-months prior to the first round of surveying (that is, December 2006, January and February 2007). Building consent applications were chosen as a suitable sample frame as they are publicly available and contain

information on what type and level of alterations or construction had been conducted. That is, consents which were considered as minor alterations or as not highly relevant (for example, the addition of a swimming pool) were left out of selection.

A postal survey was chosen as the most appropriate form of survey instrument given the limited resources and time available to this research. A large factor which influenced the choice of postal as the survey method was the information available from the survey lists. That is, all lists contained postal addresses but not all necessarily had email addresses.

Five key topic areas were assessed in this research. They were:

- The relative knowledge gained from the service;
- Attitudes and motivations towards eco-design;
- Actual behaviours;
- Perceived value of the service;
- Demographics.

Questions related both to the level of an individual person and to the design of their home (for the homeowner sample groups) or to the design of many homes (for the designer sample groups).

Data Collection

Data collection began in March 2007 and continued through until June 30th 2007. Several clusters of surveys were sent out over this time due to more clients being added to the sample frame that the EDA's had seen over the period from March 2007. Only one mail-out was conducted to the two control groups in March 2007. Data analysis began in July 2007.

Non-response was followed up for only the survey group of designers who saw an EDA. This was because they were only a small group to begin with (n=32) and because the impact of the scheme on this sub-group is thought to be the most important. Surveys were re-sent 2-months after the initial mail-out. As responses were anonymous it had to be re-sent to all designers on the list again with a polite reminder or thank you (for those who had already responded) added to the cover letter.

Limitations that occurred as a result of the postal delivery method were the added time to produce and send out the survey and in collating returned surveys and entering responses. Five percent of the total surveys distributed were non-contacts. That is, they were returned due to incorrect address details or because the participant had changed addresses.

Survey Results and Analysis

The surveys will be analysed in terms of the individual sub-group populations (that is, designers and homeowners who have either seen an EDA or not), how they compare to each other (for example, designers who saw an EDA compared to designers who did not), and finally as an overall combined group to make estimates to the survey populations and generalisations to the target populations.

Note that these results were accurate at the time of writing (July 2007), and may not be representative of the full data set. A full report consisting of more detailed analyses and results will be available from September 2007. Some preliminary analyses and results are presented below however.

A. Willingness to Pay

All participants were asked about their willingness to pay for the service given three different scenarios:

- An available service that has an associated fee (that is, user-pays);
- A free service that is funded by a general increase in building consent fees;
- A free service that is funded by government as a public benefit.

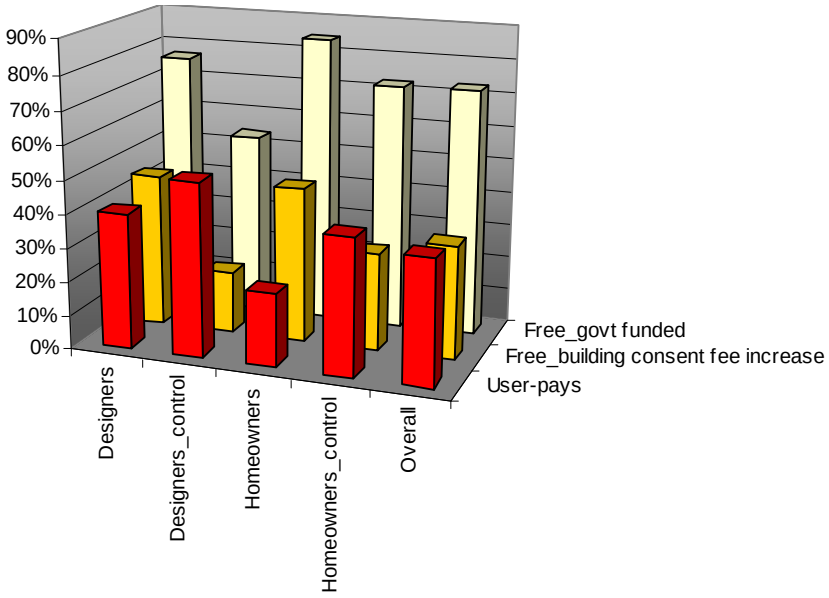

Figure 2: Willingness to Pay for the EDA Service

Results from the survey regarding how the cost for the service should be covered, clearly show that there is strong support for the scheme to remain a free service that is funded by government as a public benefit (refer to Figure 2). Comments from respondents also support this finding for the scheme to remain a free service provided through local councils:

"I think this service should stay FREE so all people can use it. The EDA is so knowledgeable - it is a great service. Thank you." (homeowner)

"I believe most kiwis would do there bit if they were more educated and that given advise on design and long term savings etc. Government have to get it in front of people free!" (homeowner)

B. Future Demand

Participants were asked whether they would use the EDA service again in the future, or in the case of the two control groups, whether they would use a service that "provided free advice on environmental design options".

Results clearly showed a strong demand for using the service either again or for the first time in the future (see Figure 3 following). As could be expected, designers said they were more likely to use the service for a specific question or client, whereas homeowners were not as concerned to use the service if they did not have a specific query in mind already. Specific comments included:

"Please continue this service - the world needs to do more eco-building!" (homeowner)

"(I) think this is a great service and needs to be carried on." (homeowner)

"Excellent services - should be New Zealand wide." (homeowner)

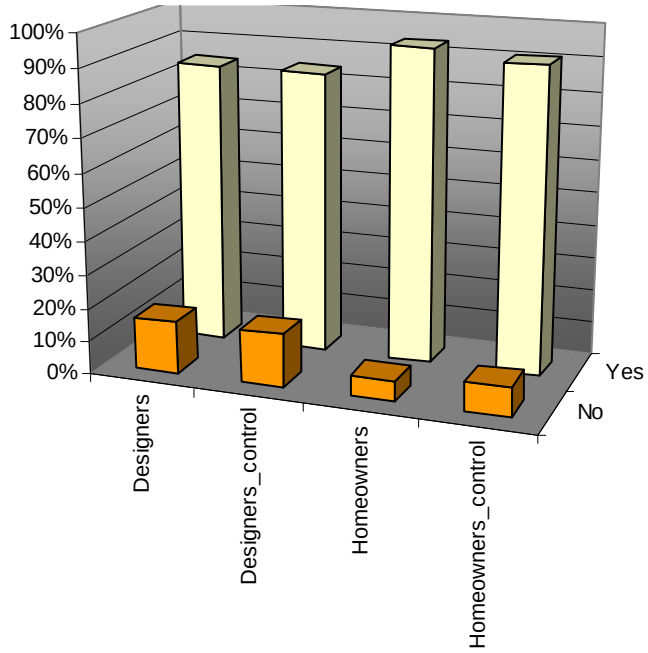

Figure 3: Future Demand for the EDA Service

C. Recommend Scheme to Others

Designers and homeowners who had already seen the EDA were also asked if they would recommend the EDA service to others or future clients (refer to Figure 4).

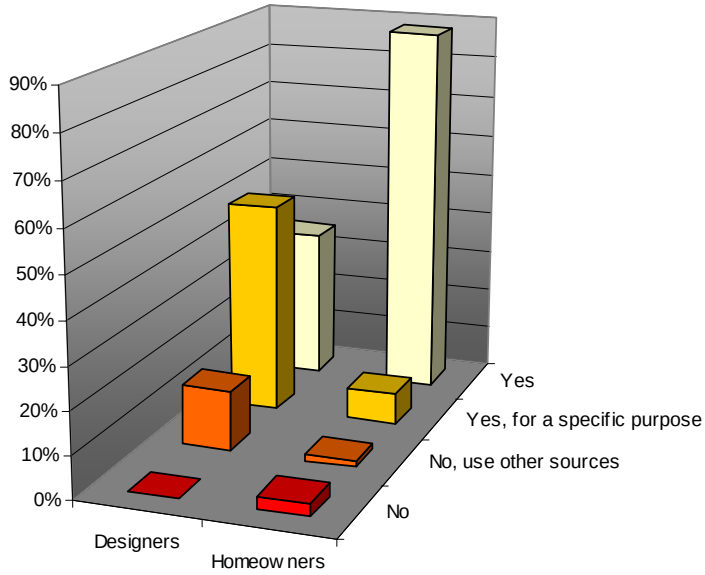

Figure 4: Recommend EDA Service to Others

Once again, the results clearly highlight that people who have already visited the EDA are willing and likely to recommend the EDA service to others or to their future clients. Already, there is evidence to suggest that this is happening:

"We bought our house at the end of August 2006 and wanted to change our heating system and were thinking about putting in underfloor insulation - had talked to a neighbour about this - they recommended the EDA." (homeowner)

D. Relative Knowledge Gain, Attitude and Behaviour Change

Of the designers who saw an EDA, 67% thought the EDA had been effective in increasing their knowledge for environmentally sustainable design.

Sixty percent of the designers who responded said that as a result of meeting with an EDA, they now discuss eco-options with their clients more so than they did prior to the meeting. In addition, 85% stated that since meeting with an EDA, they now intend to do (or have done so already) further additional training on environmental design

An interesting trend emerging from the survey results shows that compared to before they saw an EDA, 71% of homeowners now believe that incorporating eco-design practices into their houses is worthwhile, and 49% believe that it will increase the market value of their house. Additional changes in homeowners attitudes towards environmentally sustainable design after consultation with an EDA include that 69% now believe it will benefit their lifestyle and 56% realise that it is easier to include into their homes than they previously had thought.

E. General Comments

Further comments which support the future demand and need for the scheme include:

"We have finished our house now, but found it a bit difficult to obtain good advice when we were seeking it last year. Especially advice not contaminated with advertising for a product!" (homeowner_control)

"I feel the service is invaluable to those who are not so aware - i.e. it would be great to make a visit compulsory to all thinking of building/renovating." (homeowner)

"The EDA definitely made me more aware of eco design. There should be more advisors throughout NZ, either attached to local authorities or BRANZ." (designer)

"Great service and I hope the professional designers use it!" (homeowner)

"(Their) advice was most helpful and spending time discussing the issues helped me learn more than I hoped for." (designer)

It should be noted that the characteristics of the people visiting the EDA in the first place are already likely to have an interest in eco-design and are therefore be more aware and open to the concepts of eco-design. This needs to be contextualised, however, as the survey asks for relative improvements (behaviour change before/after EDA meeting) rather than absolute levels of behaviour.

CONCLUSION

The 10 month pilot project has been an overwhelming success, filling a definite need for independent, sustainable building advice for both the building industry as well as the public. Although the full results have yet to be processed, preliminary results to date show:

- In terms of user's willingness to pay for the EDA service, there was clear and strong support for the service to remain free, and funded by government as a public benefit.
- There was a strong demand for using the service either again or for the first time in the future. Designers said they were more likely to use the service for a specific question or client.
- People who have already visited the EDA are willing and likely to recommend the EDA service to others who may be about to build/renovate, or, to their future clients.
- A session with the EDA's resulted in a considerable increase in the overall environmental performance of the design being examined, with a doubling of their Green Home Scheme performance score.

- There is evidence that the influence of the EDAs were over several environmental issues (such as thermal performance, appliance resource use, water economy, indoor air quality), rather than just one.
- The EDA clients were likely to be more environmentally proactive than the average Auckland home owner, having already many more environmental features at the early design stage.
- 'Thermal performance' was the most popular environmental-building upgrade (intended) to be carried out, as a result of the EDA sessions, followed by 'water economy'.

It was only through this type of extensive evaluation that pertinent and detailed information can be gained and fed back in to the wider community, adding to the schemes scientific robustness and ensuring it is responsive to the demands of industry and homeowners.

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