LOW CARBON LIVING CRC

'Designing in' – media and communications for low carbon home renovation

Australian Government
Department of Industry,
Innovation and Science

Business
Cooperative Research
Centres Programme

LOW CARBON LIVING
CRC

Acknowledgements

Disclaimer

Peer Review Statement

The CRCLCL recognises the value of knowledge exchange and the importance of objective peer review. It is committed to encouraging and supporting its research teams in this regard.

The author(s) confirm(s) that this document has been reviewed and approved by the project's steering committee and by its program leader. These reviewers evaluated its:

- originality
- methodology
- rigour
- compliance with ethical guidelines
- conclusions against results
- conformity with the principles of the Australian Code for the Responsible Conduct of Research (NHMRC 2007),

and provided constructive feedback which was considered and addressed by the author(s).

Contents

List of Figures

LOW CARBON LIVING CRC

Acronyms

ANT   Actor Network Theory

ATA   Alternative Technology Association

CRC   Collaborative Research Centre

DIY   Do-It-Yourself

IXD   Interaction Design

HCD   Human-Centred Design

HCI   Human-Computer Interaction

LCL   Low-carbon Living

UX   User Experience

Executive Summary

This Report

This is the third report of a project which aims to explore the role and capacity of media to influence home renovation practices in established homes to produce more energy efficient outcomes and contribute to reducing Australia's carbon emissions. Prior reports have focused largely on the outcomes of the social and media research components of the project. These were: i) Hulse, K., Podkalicka, A., Milne, E., Winfree, T., & Melles, G. (2015). "I"d just Google it': media and home renovation practices in Australia, CRC for Low Carbon Living, Sydney, NSW and ii) Podkalicka, A., Milne, E., Hulse, K., Winfree, T., & Melles, G. (2016). Hashtag Sustainability? Home Renovators' Media World. Sydney, NSW.

Building on this prior work, this report focuses on the outcome of design interventions to develop media and communication strategies that can be effective in promoting low carbon renovation practices. It is based on co-design workshops conducted through 2016-2017 during which we explored the current and future capacity of digital tools to influence the home renovation decision process. In what follows, we provide theoretical justification and methodological rationale for the approach taken and illustrate with evidence. Where possible in this report we include weblinks to sources and images of the process. In particular there is a live link to the final prototyped website.

Approach

The second (design) phase of the CRC LCL RP3021 project aimed to explore the capacity of design methods and approaches to produce tangible (digital) research outcomes with potential for commercialisation. The approach taken was research through design and the specific methodology inspired by a structured design thinking process. During the eighteen months that the design work continued, industry stakeholders, CRC LCL researchers, design and IT students, a UX designer, and other participants were involved in co-designing prototype digital tools aimed primarily at homeowners engaged in residential renovation projects, particularly where they engaged professionals and had to project manage the process. The activities undertaken took place in a co-design laboratory, centred on the Swinburne Design Factory, in which there was a high level of involvement from renovators, practitioners, intermediaries and CRC partners and inbuilt evaluation of new approaches and techniques.

Outputs

The outputs from this phase of the project are: i) a prototype for a web-based tool with 72 linked screens that could be developed commercially for PC, tablets and as an app, which includes low carbon ideas, products and services as part of a mainstream home renovation; ii) this report which outlines the design thinking process behind the prototype and ways in which possible digital tools were developed and tested within a living laboratory context.

Introduction: building on prior research evidence

This is a report of a project which aimed to design, develop and assess innovative media and communication strategies to drive mainstream adoption of low carbon products and practices as an integral part of renovation projects, enabling decarbonisation of the existing residential building stock. The focus on media and communications is a means of incorporating low carbon strategies in mainstream renovations rather than being a niche 'green' market.

- In the first stage of the project, a variety of traditional and innovative research methods were used to explore mainstream home renovation practices and investigate how renovation practices were enmeshed with media engagement across broad digital and print channels.

- The second stage, comprising the design component, was informed by, and builds on, this prior social and media research. It involved prototyping and testing a digital web-based tool that would enable homeowners and other actors to engage with the relevant intermediaries through a renovation decision journey that incorporated consideration of low carbon products and practices at all stages.

We start by reiterating some of the key findings from the social and media research, and from the international literature, on the significance and value of media for home renovations

Media provides the context for, and influences, home renovation practice

Renovation practices occur in a context where traditional (print, broadcast) and digital media influence decisions in positive and negative ways with respect to sustainability objectives. During the first two years of the project, our empirical social and media research analysis (Hulse, Podkalicka, Milne, Winfree, & Melles, 2015; Podkalicka, Milne, Hulse, Winfree and Melles 2016) confirmed in a systematic and nuanced way existing claims about the significance and value of traditional and digital media in shaping home renovation practices – both as an ideological and practical influence (see also Buchanan, 2004; Gluch & Stenberg, 2006; Leonard, Perkins, & Thorns, 2004).

Media representations of current lifestyle can exert varied influence on identities and beliefs of homeowners, including those related to sustainability and energy efficiency. As we have noted, some mainstream media characterisations, e.g. in reality programs such as The Block, can lead to unrealistic expectations and misinformation about capital and on-going costs and returns (Hulse et al 2015; Podkalicka et al. 2016). However, we also found that mainstream property TV such as The Block and Grand Designs offer productive opportunities for self-education. Home renovators and building practitioners reported they often gained practical ideas from these sources. More generally, our research

has confirmed, there are a range of intermediaries between homeowners and trade professionals who play significant roles in the overall renovation practice ecosystem.

These influences on homeowner and other stakeholder choices are occurring in a context of shifting policy initiatives, e.g. the Smarter Choice NSW program (Institute for Sustainable Futures, 2015), increasing reliance on coal (Australian Government, 2016), and a lack of a national policy on sustainability to 2050 (Jackson *et al.*, 2017). Media influence on residential renovation decisions can ultimately only be understood in such this broader socio-economic and political context.

Decision-making on home renovation reflects a complex mixture of emotional, practical and financial factors

Media influence on home renovation is primarily connected with lifestyle and identity choices rather than concerns about environmental sustainability, which themselves reflect social trends. A report by the popular home renovator web site HOUZZ on reasons to renovate (n=11,329) noted that sustainability concerns ranked only sixth among the eight top priorities although energy efficiency ranked fourth (HOUZZ & Home, 2015). Clearly, messages other than sustainability, such as aesthetic concerns and costs and return on investment, are driving renovation practice, which in addition remains a somewhat 'hidden' practice. Thus, in Australia less than 25% of the estimated $32 Billion (HIA, 2016) spent on renovations and alternations triggers permits and enters into official, e.g. ABS Statistics.

Figure 1: Competing discourses around renovation: Source https://www.eventbrite.com.au/e/australias-rapid-renovation-expert-live-perth-2017-free-tickets-limited-seats-tickets-31245709759

The Australian experience accords with some international studies as well. In their three-year UK study, Wilson et al. (2015) found that applied behavioural and sociological research on renovation decisions allowed a more nuanced view of renovations than the largely financial and investment drivers typically quoted. Thus, renovation and alternation is an iceberg of significant and poorly understood proportions being driven by social and economic considerations at some distance from low carbon living (e.g. Kriese & Scholz, 2012). Emotional, practical and financial factors drive decision-making and the discourse on sustainability,

LOW CARBON LIVING CRC

including explicit reference to low carbon or sustainability factors, e.g. social costs, ethics, require review.

Communication strategies must consider the role and importance of intermediaries in home renovation practices as well as alternative discourses

The finding that media, intermediaries, and professionals play a role in influencing the renovator decision process was highlighted in our social and media research and confirmed in the literature which emphasises renovation as a situated social practice (e.g. Brand, 2010; Karvonen, 2013; Maller, Horne, & Dalton, 2012; Wilson et al., 2015). As a situated social practice this implies that intermediaries and media – in fact both 'actors' from an actor network theory (ANT) perspective – need to be considered in any design response, e.g. interface and channels for builders, (LCL) intermediaries, social media, etc. Media is channelling and framing social interaction.

This was translated into the design research work, where we needed to explicitly integrate intermediaries of different types within the home renovation decision making process. In developing a prototype to assist home renovators to include consideration of low carbon products and practices in their decision making as a matter of course, we developed interface(s) to engage intermediaries.

It is also clear from prior research that media and intermediaries may have little to do with sustainability. The DIY 'makeover' discourse, including with reference to renovation, has been mainstreamed into an acceptable identity compatible with other mainstream identities. As Watson & Shove (2008) note centred around the DIY project, including renovation projects are a series of variables or concepts which cumulatively constitute environments for new projects, 'each project and each task of which each project is made is of consequence for the development of competence, skill or disillusionment, and so for the formulation, or otherwise, of new projects' (Watson & Shove 2008, p.86)

The DIY project, certainly part of the overall drive and practice of renovation, has been called the new urban practice (Grubbauer, 2015). Mackay & Perkins conclude that the commercial-cultural DIYed home 'entanglement' is 'a product of the relationship between human action (i.e. people actively and consciously carrying out DIY projects in and around their house and home) and the wider commercial 'structures' which shape, enable and constrain that activity' (Mackay & Perkins 2016: 773). The key question is - can such a discourse be strategically used to further sustainability?

Many Australian home renovations, however, do include intermediaries, defined by Backhaus (2010) broadly as individuals and organizations that bridge the gap between policy makers, consumers and providers, e.g. builders and designers. This broad definition allows for any actors who are not directly involved in the market transactions of renovation products and services. The functions of intermediaries in social learning for

innovation are multiple but have been summarized as facilitating, brokering and configuring (Stewart & Sampsa, 2008). A recent Manchester (UK) study highlights the significance of intermediaries and community champions for change (Low Carbon Housing Retrofit, 2011). Thus, future studies should focus on the complex ecosystem and social networks of intermediaries influencing and co-producing the current renovation outcomes we see.

Intermediaries must be trusted if they are to be effective

Intermediaries are associated with engendering trust in a market transaction between homeowners and producers otherwise characterised by standard market imperfections of incomplete knowledge. Karvonen (2013) notes that 'intermediaries bridge the gap between distant government carbon reduction targets and the rhythms of domestic life by developing trust and confidence in the tools, processes and actors involved in domestic retrofit' (Karvonen, 2013, p. 571). In their Manchester (UK) study Owen, Mitchell and Goodall (A. Owen, Mitchell, & Gouldson, 2014) meanwhile refer to low carbon retrofit and installers, who offer advice and evaluation while also then providing goods and services, raising questions among householders about possible conflicts of interest.

In Australia numerous organisations and sites play this intermediary role. The Alternative Technology Association (ATA) with its associated media and events, e.g. Sustainable House Day; Sustainability Victoria and its associated practical information about energy efficiency and home renovation; the Transition Town movement, etc. In the Internet era, civil society also plays the role of intermediaries, e.g. Whirlpool Forum – see our prior report (Podkalicka et al. 2016). Such intermediaries rely on a range of face to face and digital channels and supports to interact with homeowners and the other actors in the renovation practice system.

As Horne & Dalton (2014) have argued, the emergence of eco-renovation businesses and practices in Australia has been accompanied by intermediaries, e.g. associations, community groups, advisors, playing a greater role in decision making in this space. While they appear to exclude (social) internet groups, they argue that other intermediaries can play a greater role in promoting low carbon living. They focus particularly on project managers including for energy retrofits, e.g. LED lighting, but also note finance intermediaries in passing, e.g. organisations making funds available for targeted renovation, e.g. banks with 'green packages'; this is similar to government green program subsidies and taxes in its effects.

The potential of a co-design approach to reshaping renovation practices to reduce carbon emissions from existing housing

Overviewing the limitations of demand management and social practice approaches to promote low carbon living,

LOW CARBON LIVING CRC

Strengers (2011) proposed a co-management of everyday practices approach as a key to reconfiguring the relationship between consumers and providers, particularly with respect to energy efficiency. In effect, the increasing access to utility tools to monitor energy use, product energy ratings, and a range of other tools seem to be producing just such a scenario. The digital tools examined and designed for this project also contribute to potential co-management of everyday practices in the relevant sense.

An interaction design (thinking) approach

For this project, both the general principles of design thinking and research through design as articulated especially in interaction design were crucial. While commercial firms and government agencies continue to develop mobile and web-based applications for a range of users, e.g. builders, homeowners, learners, in this space, the impact of these technologies on low carbon practices remains unclear. While smart metering (e.g. Anda & Temmen, 2014), smart homes and the development of solar energy storage and distributed systems all hold 'technological' promise reaching all sectors of society, including in the outer suburbs (e.g. Davison, 2006), affordability, behavioural and other psychological barriers remains a challenge (Newton 2013).

Relative to other approaches to digital design, interaction design (IxD) treats (as the name suggests) socio-technical interaction as the key issue for design, i.e. the primary question is what interactions do we want to enable and how can we best achieve this. The Interaction Design Foundation defines IxD (simply) as the design of the interaction between users and products.

In an interaction design context, design thinking, as Zimmerman et al note (2007) means 'the application of a design process that involves:

- grounding—investigation to gain multiple perspectives on a problem;

- ideation— generation of many possible different solutions;

- iteration— cyclical process of refining concept with increasing fidelity; and

- reflection (Zimmerman et al., 2007, p. 494).

Design it should be added is intrinsically concerned with designing desirable ('ought to be') futures in the various domains in which it works, e.g. digital, space, media, i.e. prototyping and testing best case interactions. In their paper, Zimmerman et al. (2007) illustrate the research through design process towards what 'out to be' as follows (Figure 2). Thus, theory based models, technology and field data are inputs to the interaction design process. Based on such primary and secondary data, through concepting and prototyping, the designer examines technical opportunities and unanticipated effects on stakeholders. These effects and the relevant feedback challenge existing theories and technologies.
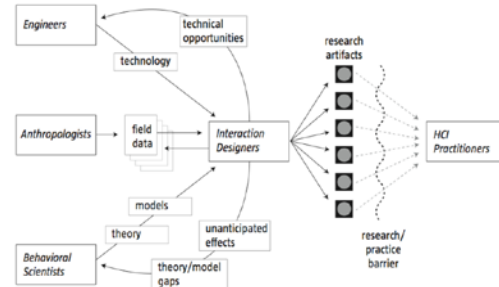

Figure 2. An illustration of the pathways and deliverables between and among Interaction Design Researchers and HCI Researchers. The model emphasizes the production of artifacts as vehicles for embodying what "ought to be" and that influence both the research and practice communities.

Figure 2: Interaction Design Approach (Zimmerman et al 2007)

Interaction design work as illustrated here stands as intermediary and facilitator between different forms of disciplinary knowledge and research outputs. Through the tangible visualisation and prototyping of digital responses to an evolving brief, a range of research artefacts are produced which may in some circumstances lead to commercialisation. The same logic and research-practice boundary underpinned this phase of the project as we explored through co-design workshops with stakeholders the value and limitations of existing approaches and sought through the process to generate new tangible 'ought to be' knowledge or 'design fictions' .

As Wakkary et al (2013) observe, 'We see design fictions as a designerly response to social practices in that rather than focus on social analysis and policies, designers engage in a material reflection that is based in making and doing, where scenarios, prototypes, sketches, and illustrations are materials of thought for design' (Wakkary et al., 2013, p. 3). In their paper they describe two studies – everyday repair and green DIY - which employed a range of methods to generate narratives and images that were constructed into 'fictions' that became the basis of interaction design work. In essence they generated textual and visual 'fictions' as a form of multimodal social practice analysis. Such visualisations then can be employed as the basis for interaction design work. They conclude that 'a practice-oriented approach can help interaction designers step away from models of individual behavior and studies of artefacts towards seeing sustainable behaviors as parts of multidimensional and interrelated practices' (2013, p.30).

Research through Design in a Living Laboratory

Overview of the process

Adopting the broad four phase approach mentioned earlier – in design jargon called the Inspiration-Ideation-Implementation- approach to design thinking (and preceded by a social and media research grounding phase) for this project we planned workshops and design activity with stakeholders over the period: Phase 1- January-June (2016); Phase 2 June-December (2016) and Phase 3 January to June (2017). The modest budget and Swinburne in-kind contribution assigned to the project was spread between these activities. This report in its focus on reflection of the process might usefully be designated stage 4.

In the initial Inspiration phase, we engaged nine students in an industry-academic honours project - assigned to this work – in an agreement with Swinburne Design Factory (SDF). Two teams of students were tasked to generate ideas and concepts consistent with inputs from workshop meetings with stakeholders, guidance from the research team, and reviews of existing digital tools and concepts.

In the second phase, we continued with the logic of engaging students – this time a group of four IT students – to develop ideas into low fidelity prototypes for web and app development. Workshops were again organised with stakeholders to review existing tools and discover opportunity.

The final phase of the project then employed a professional UX designer to develop a specific web-based tool into a functioning prototype with sufficient merit and input for further development. The final design, which was prototyped, consisted of 72 linked screens and is currently the subject of further development by students. We report below on the outcomes of these three phases as an illustration not only of outcomes achieved but also to demonstrate the nature and value of the process for future work.

Inspiration Phase with Renovators, Industry Partners and Design Factory Students 2016

A project brief was developed and distributed to students (see appendices). There was negotiation in the first weeks with students regarding the details of the brief. Students divided into two groups worked to develop ideas under the guidance of Swinburne Design Factory lecturers and the CRC LCL 3021 research team

Figure 3: Design Factory Students Present Initial Ideas

The student work through this period led to gradual refinement of the focus and an interim presentation in week 6 to the research team on results to date (images below from week 6)

Figure 4: Design Factory Early Prototyping Week 6 Phase One

One issue that emerged as significant for the project were clearer communication to target groups and one group of students in the Flippa project proposed a rental investor guide focused on rental investors (the term we retained) and more specifically 'rentvestors'[1]. Of interest to the project, is how they make decisions about renovation of their purchased properties.

---

[1] Rentvestor was originally a term used by the real estate company L J Hooker as one of the key trends for under 30s in the housing market who could not afford to buy in areas they wanted to live and which has since been used widely in traditional and digital media.
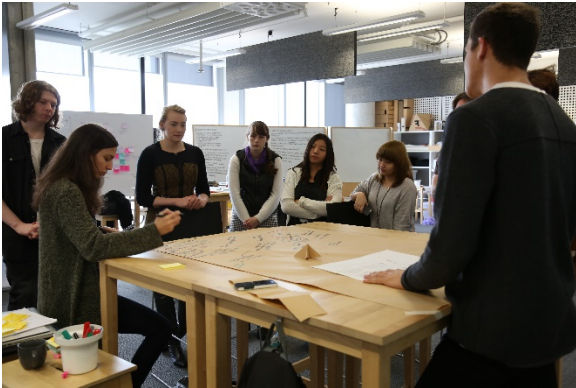
LOW CARBON LIVING CRC

Figure 5: Week Six Revised Brief Discussions

The project produced two personas – a renovate for life persona and a rental investor – the first focused on those renovating due to changes in domestic circumstances with the intention of continuing to live in the home and the second focussed more on return on investment. Throughout the process, it was important that students developed relevant user personas for the design (as illustrated below). Personas provide an 'averaged' typical user for specific projects and typically multiple examples are produced to account for variation.

Figure 6: rental investor guide to renovation: student images

The process also integrated workshops with stakeholders, including Cecile Weldon from 'The 17 Things' (now CSIRO managed). This early stage provided important ideas for stage 2 (ideation) and for the implementation stage (phase 3) which followed in 2017. The significance of this observation is that the design process, while typically longer than a standard commercial brief provides a range of ideas and concepts, which are available for future development beyond the life of the project. In an environment where open innovation is important it is also important to be able to generate a range of options.

PERSONA TWO
LAUREN LOVELACE

Personality/Habits

Tech Savy

Social/Community Minded

Time Poor

Environmentally Aware/Interested

Character Profile	
Age	23
Location	Marylands
Ethnic Background	Australian
Marital Status	Not Married
Family Composition	No children
Job	Sales executive
Income	$85,000
Work	Full-time

Background

At the age of 20 Lauren bought her first home as an investment property: a one-bedroom apartment in East Perth. At 23, she now has a second investment property, this time a four-bedroom home in Bassendean. This allows her to rent a riverside property in Maylands that she would not be able to afford otherwise, she even plans upgrade to a new rental in Scarborough. Lauren said rentvesting helped her get her foot in the property door but has stated she 'much more focused on growing my portfolio than buying a home to live in' (Hennessy 2015).

Figure 7: Persona Example Generated

A second element that emerged as important was website design for homeowners with capacity to calculate and adjust for additions and alternations as well as integrating advice from credible sources, e.g. sites on sustainable renovations developed by Sustainability Victoria.

Students designed a mobile scalable website integrating product energy and materials choices as illustrated in the image below. This element of the package of concepts (fig.8) focused on giving homeowners the option of choosing products to fit their renovation scenario and having this information labelled with energy efficiency, pricing and other elements.

The outcomes of this student work helped establish some of the possibilities for the team moving forward. In particular, several elements, e.g. website, e-books, mobile applications, and other elements would become a focus for subsequent work. It was decided to narrow the focus in the second half of 2016 on taking these design ideas further with some help from third year IT capstone students.
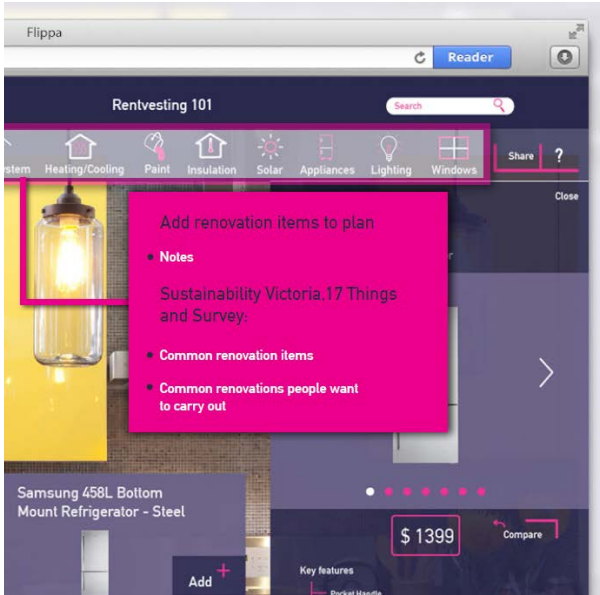
LOW CARBON LIVING CRC

Figure 8: Section of Website Mockup with Labelling

Second phase Ideation Development: IT Students and workshops 2016

Following the outcomes of the initial student work in Swinburne Design Factory, the project then moved to the ideation phase where the narrower agenda identified in the first phase could be developed into workable concepts and tested with stakeholders. Four third year capstone IT students were engaged during this period and workshops with industry stakeholders run to test concepts. The insights from the first phase as identified in the workshop presentation included

- Housing typology matters as much as Persona characteristics

- Mainstreaming sustainable living is key goal

- Not more information but better communication

- Create another tool or mashup or planner for the renovation process

- Limited acknowledgement of the decision journey

- Existing social media, digital tools, e.g. Pinterest, underutilized

- Target market (Renovation budget is $50-$250k) engaging a building professional

- Liveability: The 17 things provide essential alternative discourse

- Renovators and professionals may need new skills

This led to identifying both a renovation journey and touchpoints in that journey that needed to be considered as illustrated in figure 9.

Figure 9: Two of Five Touchpoints and Tools for Workshop Phase 2

For the stakeholder workshop which included project partners, e.g. Sustainability Victoria and CSR Products, as well as others, two renovation scenarios were developed to explore participants' capacity to employ these tools and follow the design thinking process while simultaneously gathering their expertise and input.

Introducing a competitive element into the workshop and allowing teams to compete against each other on the best renovation outcome was then compared with an ideal scenario renovation. Simultaneously we tested the role of the different kinds of media at each stage of the journey in a 'mash-up' of sorts. The outcomes of this workshop, which the IT students also attended, allowed us to further refine our design ideas and to task the students with concept work.

Figure 10: Workshop 1 Renovation Site

This included wireframing ideas into a website. Wireframing as illustrated below consists in a lean stripped down version of the relevant interface being

produced. This enables a 'lite' version to be developed and revised prior to investing time in a detailed build. The image below (Figure 11) 'wireframed' a GPS or GIS enabled mapping component. This would identify for homeowners locations where registered users had similar renovations (or components of the process) and could be contacted for further advice on materials, professionals, etc.
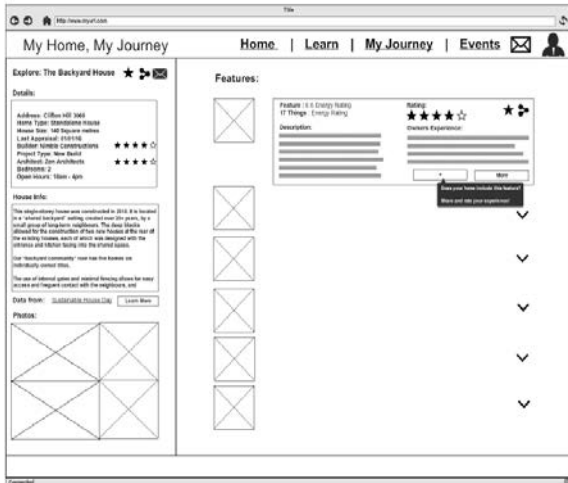

Figure 11: Wireframed Website

At this stage also we experimented with converting the 17 Things Liveability framework into a mobile application for Android (Figure 12)
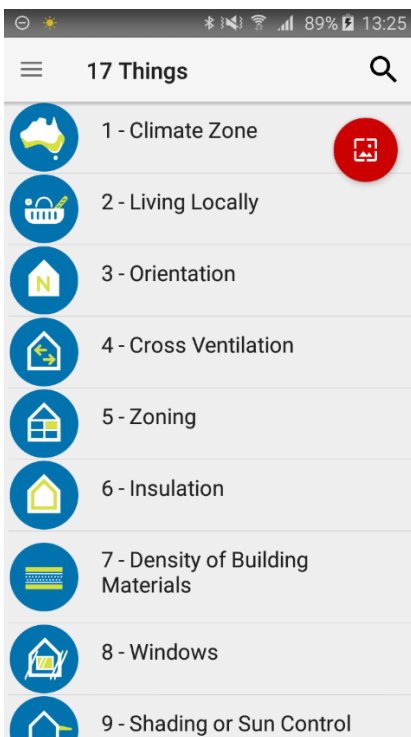

Figure 12: Android Interface 17 things Application

Thus by the end of this second ideation phase in November 2016 we had explored the value of certain digital tools within the renovation process, had ideated

some concepts and early prototypes (as above), and had sufficient feedback and input to move to the third phase in 2017.

The critical insight from the 2nd workshop was it was important that renovators had a tool to speed up the process – ie less time planning and finding out and more time making decisions – the 'renovator accelerator' – to use one participant's term. This was the case as the existing portfolio of digital tools, e.g. Pinterest, budget calculators, and the decision making process had not been synthesized into an overarching tool addressing the renovation journey.

Implementation

In the third implementation phase we employed a UX designer to help us prototype and build a website for homeowners integrating the elements we had explored. Readers can view the prototype on their favourite mobile device at (may have to copy link and open):

http://invis.io/GKC61IM47

Having reviewed the early prototype of the Build4Life (B4L) CRC LCL project, a major point of difference could be that the B4L did not distinguish renovation from new build and also envisaged a closed system limited only to registered users. The decision to proceed with website design was also because this could be scaled to tablet and mobile formats while the opposite was not necessarily the case. We chose a more open format and access, albeit behind a paywall 'curtain'.

Four versions were built through successive consultation.

- Version 1 modified to version 2 with input from the research team. One key insight was v.1 had excessive product styling focus rather than renovation journey focus, and another insight was the value (integrated into v.2) of further developing the return on investment (ROI) tabs and elements

- Version 2 then modified as a result of a stakeholder workshop including several partners, e.g. SV, CSR, and researchers.

- This version 3 was then the subject of final feedback and revision to produce v.4.

- This final version is now also potentially the subject of a full website build at the time of writing. As discussed above, if it were to be developed commercially, it would be better scaled to mobile phone formats as well as laptop and tablet.

The interface and prototype were temporarily titled 'Project Green'. In practice, of course, another name would be required as the purpose of the exercise is to assist in mainstreaming low carbon renovations not to reinforce as a niche market for the 'converted'. The site divided between a free signup and a paywall registration site, which allowed the collection of detailed data from users and also enabled connections with retailers and other intermediaries.
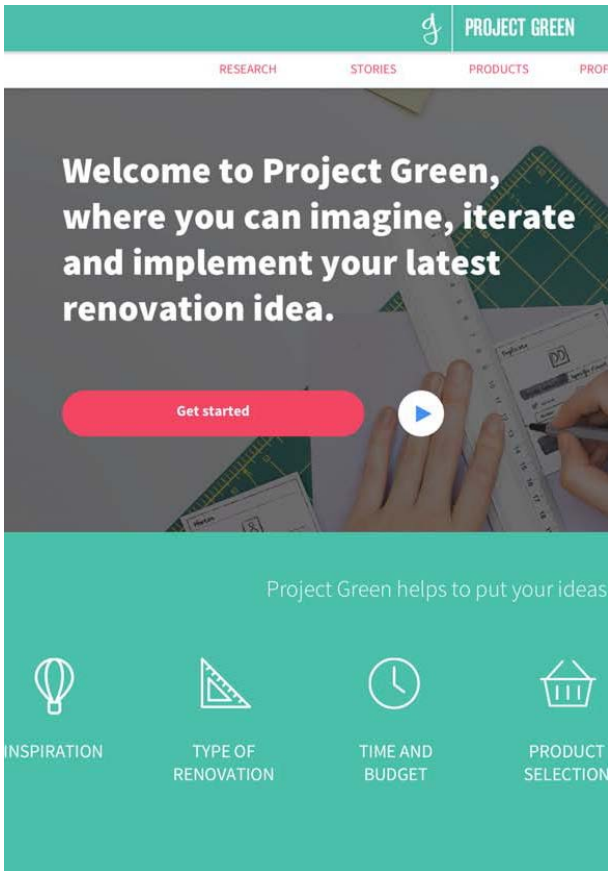
Figure 13: Project Green Website Interface

We identified establishing project goals (multiple possibilities) as important and designed accordingly. As shown below, we also aimed to give homeowners at the end of the unregistered specification process an estimate of costs and returns (Figure 14). This feature was appreciated by a number of stakeholders
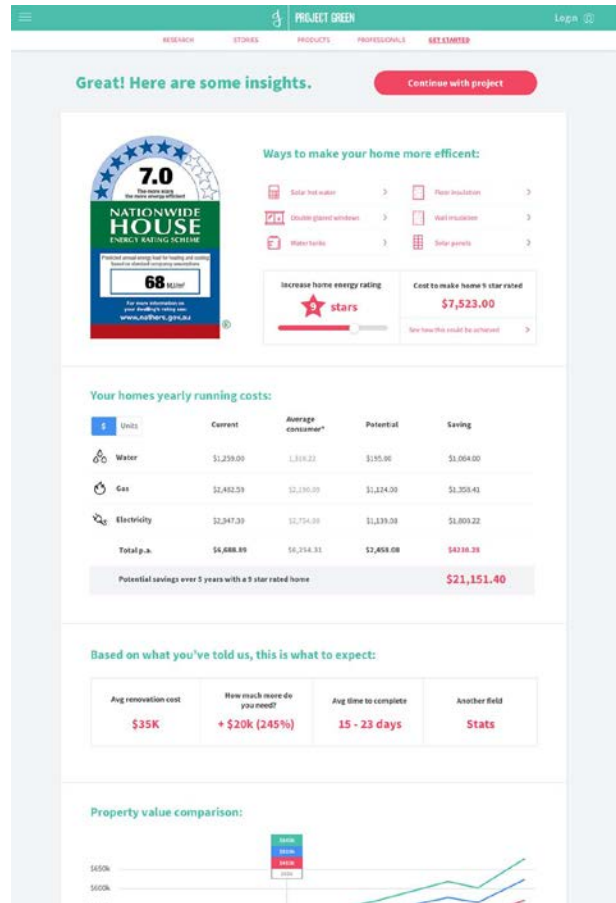

Figure 14: Renovation insights entered and financials calculated

A feature of the pay-walled site was access to professional profiles and examples of their work. The site aimed to recruit 'trusted' professionals with testimonials from other homeowners. Access to particular professionals was triggered by choice of particular products, e.g. wood decking, etc.
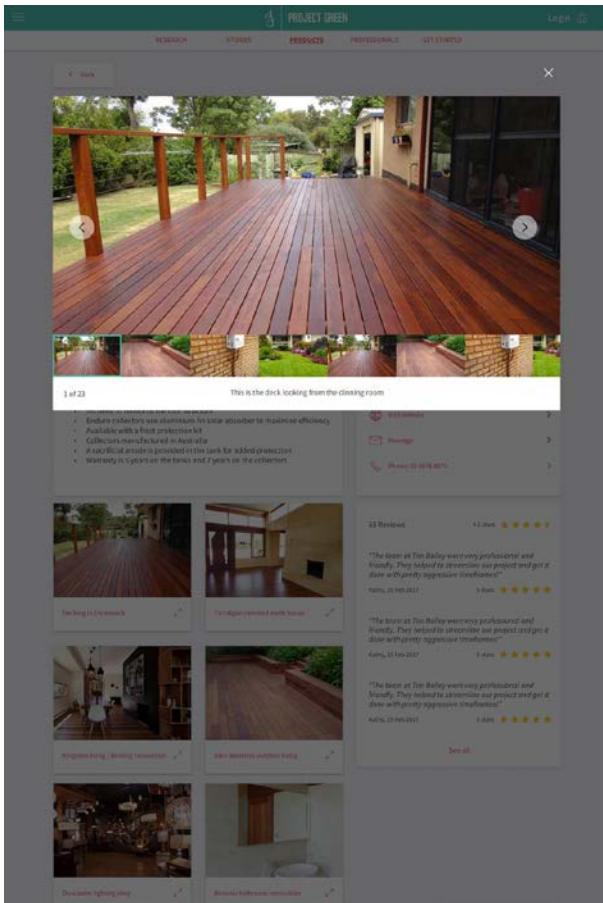
Figure 15: Professional Profile

The site aimed also to integrate intermediary advice on energy efficiency and several screens were pitched at this. By intermediary we included any 'independent' advisor, whether organisation or individual, such as Sustainability Victoria or other similar intermediary providing energy efficiency or material advice.
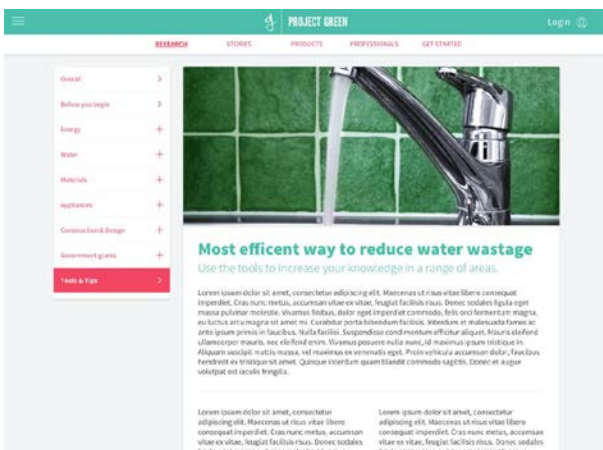

Figure 16: Tools & Tips Page

Summary

The eighteen-month RP3021 prototyping and testing process allowed tangible testing of better communication about low carbon home renovation through a web site. Whilst this was developed for laptop and tablet, all the research suggests that it is importance to have a mobile application as well. Further work on the existing prototype is planned to refine and further develop. Live prototyping and user testing of the existing site as well as potential development of scaled mobile applications may also take place. The project intends to demonstrate at the LCL Forum in November what has been achieved as a live prototype for further input.

References

Anda, M., & Temmen, J. (2014). Smart metering for residential energy efficiency: The use of community based social marketing for behavioural change and smart grid introduction. Renewable Energy, 67, 119–127. https://doi.org/10.1016/j.renene.2013.11.020

Australian Government. (2016). Australia Energy Update 2016. Canberra, ACT.

Backhaus, J. (2010). Intermediaries as Innovating Actors in the Transition to a Sustainable Energy System. Central European Journal of Public Policy, 4(1), 86–108. Retrieved from http://www.cejpp.eu/index.php/ojs/article/view/47

Brand, K.-W. (2010). Social Practices and Sustainable Consumption: Benefits and Limitations of a New Theoretical Approach. In Environmental Sociology (pp. 217–235). Dordrecht: Springer Netherlands. https://doi.org/10.1007/978-90-481-8730-0_13

Buchanan, I. (2004). Renovating Reality TV. Australian Humanties Review, April(31–32). Retrieved from http://www.australianhumanitiesreview.org/archive/Issue-April-2004/buchanan.html

Davison, A. (2006). Stuck in a Cul-de-Sac? Suburban History and Urban Sustainability in Australia. Urban Policy and Research, 24(2), 201–216. https://doi.org/10.1080/08111140600704137

Gluch, P., & Stenberg, A. (2006). How do trade media influence green building practice? Building Research & Information, 34(2), 104–117. https://doi.org/10.1080/09613210500491613

Grubbauer, M. (2015). Not everything is new in DIY: Home remodelling by amateurs as urban practice. Ephemera, 15(1), 141.

Hamann, R., & April, K. (2013). On the role and capabilities of collaborative intermediary organisations in urban sustainability transitions. Journal of Cleaner Production, 50, 12–21. https://doi.org/10.1016/j.jclepro.2012.11.017

HIA. (2016). Australia's $31.4 Billion Home Renovations Market. Media Release, (7 October).

HOUZZ & Home - Australia. (2015). Overview of AU Renovation, Custom Building & Decoration in 2014. Retrieved from Houzz.com.au

Hulse, K., Podkalicka, A., Milne, E., Winfree, T., & Melles, G. (2015). "I"d just Google it': media and home

renovation practices in Australia. Sydney, NSW. Retrieved from http://www.lowcarbonlivingcrc.com.au/sites/all/files/publications_file_attachments/rp3021_project_report2016.pdf

Institute for Sustainable Futures. (2015). The Smarter Choice Program - A Social Practice Evaluation. Sydney, NSW.

Jackson, W. J., Argent, R. M., Bax, N. J., Clark, G. F., Coleman, S., Cresswell, I. D., … Wienecke, B. (2017). Australia State of the Environment 2016 Overview. Australia State of the Environment 2016. https://doi.org/10.4226/94/58B65510C633B

Karvonen, A. (2013). Towards systemic domestic retrofit: a social practices approach. Building Research & Information, 41(5), 563–574. https://doi.org/10.1080/09613218.2013.805298

Kriese, U., & Scholz, R. W. (2012). Lifestyle Ideas of House Builders and Housing Investors. Housing, Theory and Society, 29(3), 288–320. https://doi.org/10.1080/14036096.2011.629679

Leonard, L., Perkins, H., & Thorns, D. (2004). Presenting and creating home: The influence of popular and building trade print media in the construction of home. Housing, Theory and Society, 21(3), 97–110. https://doi.org/10.1080/14036090410000480

Low Carbon Housing Retrofit. (2011). The Missing Quarter: Integrating Behaviour Change in Low Carbon Housing Retrofit. Manchester, UK.

Mackay, M., & Perkins, H. C. (2016). The globalising world of DIY house improvement: interpreting a cultural and commercial phenomenon. Housing Studies, 3037(April), 1–20. https://doi.org/10.1080/02673037.2016.1234031

Maller, C., Horne, R., & Dalton, T. (2012). Green Renovations: Intersections of Daily Routines, Housing Aspirations and Narratives of Environmental Sustainability. Housing, Theory and Society, 29(3), 255–275. https://doi.org/10.1080/14036096.2011.606332

Newton, P. W. (2013). Regenerating cities: technological and design innovation for Australian suburbs. Building Research & Information, 41(February 2015), 575–588. https://doi.org/10.1080/09613218.2013.803921

Owen, A., & Mitchell, G. (2015). Outside influence – Some effects of retrofit installers and advisors on energy behaviours in households. Indoor and Built Environment, 24(7), 925–936. https://doi.org/10.1177/1420326X15600775

Owen, A., Mitchell, G., & Gouldson, A. (2014). Unseen influence-The role of low carbon retrofit advisers and installers in the adoption and use of domestic energy technology. Energy Policy, 73, 169–179. https://doi.org/10.1016/j.enpol.2014.06.013

Podkalicka, A., Milne, E., Hulse, K., Winfree, T., & Melles, G. (2016). Hashtag Sustainability? Home Renovators' Media World. Sydney, NSW. Retrieved from http://www.lowcarbonlivingcrc.com.au/sites/all/files/publi

cations_file_attachments/rp3021_media_and_communication_strategies_final_9_march_2017_0.pdf

Rosenberg, B. C. (2011). The Our House DIY Club: Amateurs, leisure knowledge and lifestyle media. International Journal of Cultural Studies, 14(2), 173–190. https://doi.org/10.1177/1367877910382185

Simon, H. A. (1996). The Sciences of the Artificial (Third Edit). Cambridge, MA, USA: MIT Press.

Stewart, J. K., & Sampsa, H. (2008). INTERMEDIARIES, USERS AND SOCIAL LEARNING IN TECHNOLOGICAL INNOVATION. International Journal of Innovation Management, 12(3), 295–325. https://doi.org/10.1142/S1363919608002035

Strengers, Y. (2011). Beyond demand management: co-managing energy and water practices with Australian households. Policy Studies, 32(1), 35–58. https://doi.org/10.1080/01442872.2010.526413

Wakkary, R., Desjardins, A., Hauser, S., & Maestri, L. (2013). A sustainable design fiction: Green practices. ACM Transactions on Computer-Human Interaction (TOCHI), 20(4), 1–34. https://doi.org/10.1145/2494265

Watson, M., & Shove, E. (2008). Product, Competence, Project and Practice DIY and the dynamics of craft consumption. Journal of Consumer Culture, 8(1), 69–89. https://doi.org/10.1177/1469540507085726

Wilson, C., Crane, L., & Chryssochoidis, G. (2015). Why do homeowners renovate energy efficiently? Contrasting perspectives and implications for policy. Energy Research and Social Science, 7(May), 12–22. https://doi.org/10.1016/j.erss.2015.03.002

Zimmerman, J., Forlizzi, J., Evenson, S., Zimmerman, J., Forlizzi, J., & Evenson, S. (2007). Research Through Design as a Method for Interaction Design Research in HCI design research in HCI. Proceedings of the SIGCHI Conference on Human Factors in Computing Systems, 493–502. https://doi.org/http://doi.acm.org/10.1145/1240624.1240704

Reference