

Co-Design Report, Livable Bathrooms for Older People

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Co-Design Report

Livable Bathrooms for Older People

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Executive summary

This report describes the Co-Design research process carried out between 2012 and 2015 as a component of the Livable Bathrooms for Older People Project. It details the findings of the research and explains, in depth, how each step of the Co-Design investigation was conducted.

Co-Design is a means of supporting the creation of successful designs through working closely with the people who will use them. Consultation with a participatory Co-Design group advising on research directions and methods, in collaboration with members of the research team, has been a key component of the Livable Bathroom Project. The Livable Bathrooms Co-Design group consisted of six healthy older people ranging in age from mid-sixties to mid eighties.

The Co-Design group's role involved input into the research methods to guide and validate our research approach. They also participated in collaborative design workshops where their input and ideas provided insights to better “design” a bathroom environment for the future, i.e. bathroom products that are safer, more supportive for those with functional issues, more usable and more desirable and attractive. Using an action-based approach to the research, the Co-Design group has been involved in activities that allowed them to actively collaborate on assessing and developing the research findings discussed in this report. This approach has ensured that findings of the Co-Design research are directly relevant to design practice.

This report details the problems and concerns identified with existing domestic bathrooms for current and future use. It outlines a set of guiding principles to help designers meet the needs of older people. Overall, the findings can be classified into the following themes:

- o **Safety** – Ensure the environment is safe for older people and minimizes the risk of accidents, particularly falls. If an accident occurs, the environment should not cause additional harm and should enable rapid assistance.
- o **Supportive and comfortable** – the bathroom environment and fixtures should support older people in performing activities with ease. This includes providing adequate space, ample physical support, easy reach and access, adequate lighting and comfortable temperature while carrying out bathroom activities.
- o **Easy Cleaning** – The bathroom environment and fixture design should reduce the amount of cleaning required through good ventilation, lighting, smooth surfaces and easy access.

- o **Allow for other needs** – the bathroom environment should be accessible to everyone, including children, carers and people with disabilities. There is a need for products that are compatible with the use of wheelchairs and other supportive equipment.
- o **Aesthetics** – The bathroom should be a place that users are proud of, the fixtures and features should be aesthetically pleasing as well as being functional and supportive.

The Co-Designers provided valuable assistance in the development of research tools, understanding the bathroom from an older person's perspective, and collaborating with professional designers to co-create design concepts. A number of insights were developed through working with the Co-Design group that challenged the assumptions of the research team, leading to novel avenues of investigation. This involvement has helped to target our research methods to resonate with the needs and preferences of an ageing population, provide a nuanced understanding of some of the issues and concerns facing older people in the bathroom and develop integrated frameworks for the development of innovative designs.

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Meeting the Co-Designers at the Marc Newson Collection Exhibition

Introduction

The aims of the *Livable Bathrooms For Older People* Project are to establish the design fundamentals needed for the development of more flexible, innovative and safer bathroom fixtures and domestic bathroom environments for older Australians. The project investigates home bathroom environments and evaluates how they meet the needs of older Australians. One of the central approaches of this research, has been the inclusion of a participatory Co-Design group tasked to advise, and collaborate with other members of the research team to generate content and refine research methods implemented throughout the Project. Ethics approval was granted by the University of New South Wales Faculty of the Built Environment (Approval numbers 125083 and 145003).

The Co-Design research was carried out by Associate Professor Oya Demirbilek, the Co-Design Sessions Lead Investigator with assistance from PhD Students Alicia Mintzes, Steve Davey and Peter Sweatman.

Co-Design

Co-Design is a process and a design research method that supports the creation of successful designs through working closely with the people who will ultimately use them. It is a collaboration between potential real users, researchers and designers.

For the *Livable Bathrooms Project*, the Co-Designers' role is both to advise the research team about the research methods, and to participate in collaborative design workshops where their input and ideas will assist to “design” an ideal bathroom environment for older people, i.e. a bathroom that is safer, more supportive for those with functional issues, is more usable and is also desirable and attractive.

The Co-Designers on this project have assisted us by:

1. Guiding the development of and providing feedback on our research tools, namely the *Livable Bathrooms Survey* and the *Livability Lab Protocol*.
2. Helping us to understand, from an older person's perspective, which bathroom features and characteristics function well, and which don't.
3. Working with professional designers to co-create design concepts and solutions.

This involvement from older Co-Designers has helped develop our research methods and shaped them in a way that is more likely to resonate with the needs and preferences of an ageing population.

Livable Bathroom Project Co-Designers

Starting in September 2012, 6 older people volunteered to become our Co-Designers and participate in Co-Design workshops with UNSW researchers. Respondents from a survey on downsizing who had agreed to further contact were identified based on age and geographic location. The respondents who met these criteria were approached to volunteer for the Co-Design group. Below are details of all six Co-Designers.



Anna

Gender: Female
Age Group: 65-69
Anna is originally Hungarian. She joined the Co-Design group with her husband, Tony. Anna and Tony live in an apartment in the lower Northern Suburbs of Sydney.



Tony

Gender: Male
Age Group: 70-74
Tony is a retired hospital scientist in Haematology and is a volunteer for the Cancer Council. He joined the group with his wife, Anna.



Joan

Gender: Female
Age Group: 80-84
Joan lives alone in the Eastern Suburbs. She is very active and pragmatic about the future.



Penny

Gender: Female

Age Group: 65-69

Penny is a retired Occupational Therapist living alone in an apartment on the North Shore.



Joy

Gender: Female

Age Group: 75-79

Joy is originally from England. She has lived on the Upper North Shore for over 40 years and is widowed. Joy will soon be moving to Adelaide to be closer to family.



Ray

Gender: Male

Age Group: 75-79

Ray is a retired engineer from the lower North Shore. Ray took part in Workshops 1 & 2, leaving the Co-Design group in May, 2013.

Co-Design Workshops

Starting in September 2012, the Co-Design program was planned to involve eight Co-Design sessions and a final wrap-up session conducted regularly over a period of 2.5 years. Workshops took place roughly every three months and ran for 1.5 hours each. All but one session were held at the UNSW Kensington Campus at the Squarehouse Building, part of the Faculty of the Built Environment. Tea, coffee and lunch were provided.

The content and themes explored in each of the Co-Design workshops were designed to correspond with the research stages of the *Livable Bathrooms Project*. This provided timely insight to guide the content and validity of the other research components. The steps of the process are illustrated in Figure 1. The initial steps helped to guide the development of the survey and interviews, whilst further sessions coincided with the lab set up and pilot testing.

The purpose, content and outcomes of each step of the Co-Design sessions and workshops are outlined chronologically in Table 1 below. Each step is outlined in depth in the Co-Design Workshop Chapter.

Table 1: The 11 step Co-Design process on the domestic bathroom environment

Year	Step	Name	Content
2012	Step 1	Bathroom exhibition 'walk-through'	Co-Designers provided feedback on Marc Newson range of bathroom fixtures and the draft bathroom survey
2013	Step 2	Co-Design Workshop 1	Storytelling and role play were used in small groups to identify the "likes" and "dislikes" in bathrooms
	Step 3	Co-Design Workshop 2	Collage and photos were used to discover and rank concerns for the future
	Step 4	Co-Design Workshop 3	Demonstration of cutting-edge technologies and material innovations followed by discussion and questions
	Step 5	Co-Design Workshop 4	Interactive feedback concerning the Livability Lab set-up, followed by discussion and questions
2014	Step 6	Co-Design Workshop 5	Storyboarding of bathroom usage subtask scenarios
	Step 7	Presentation to Industry design team	Co-Designers findings to date and Co-Design storyboards presented to GWA Bathroom and Kitchen team
	Step 8	Co-Design Workshop 6	Presentation of bathroom design concepts developed from the Co-Designers findings and storyboards by the GWA Bathroom and Kitchen team followed by feedback and discussion
	Step 9	Co-Design Workshop 7	Introduction to immersive virtual prototyping with Oculus Rift and Kinect motion sensors followed by discussion and questions
2015	Step 10	Co-Design Livability Lab pilot tests	Pilot testing of livability laboratory protocol for feasibility and comfort
	Step 11	Co-Design Workshop 8	Review and wrap up of Co-Design workshops and update on the research findings to date, and future plans.

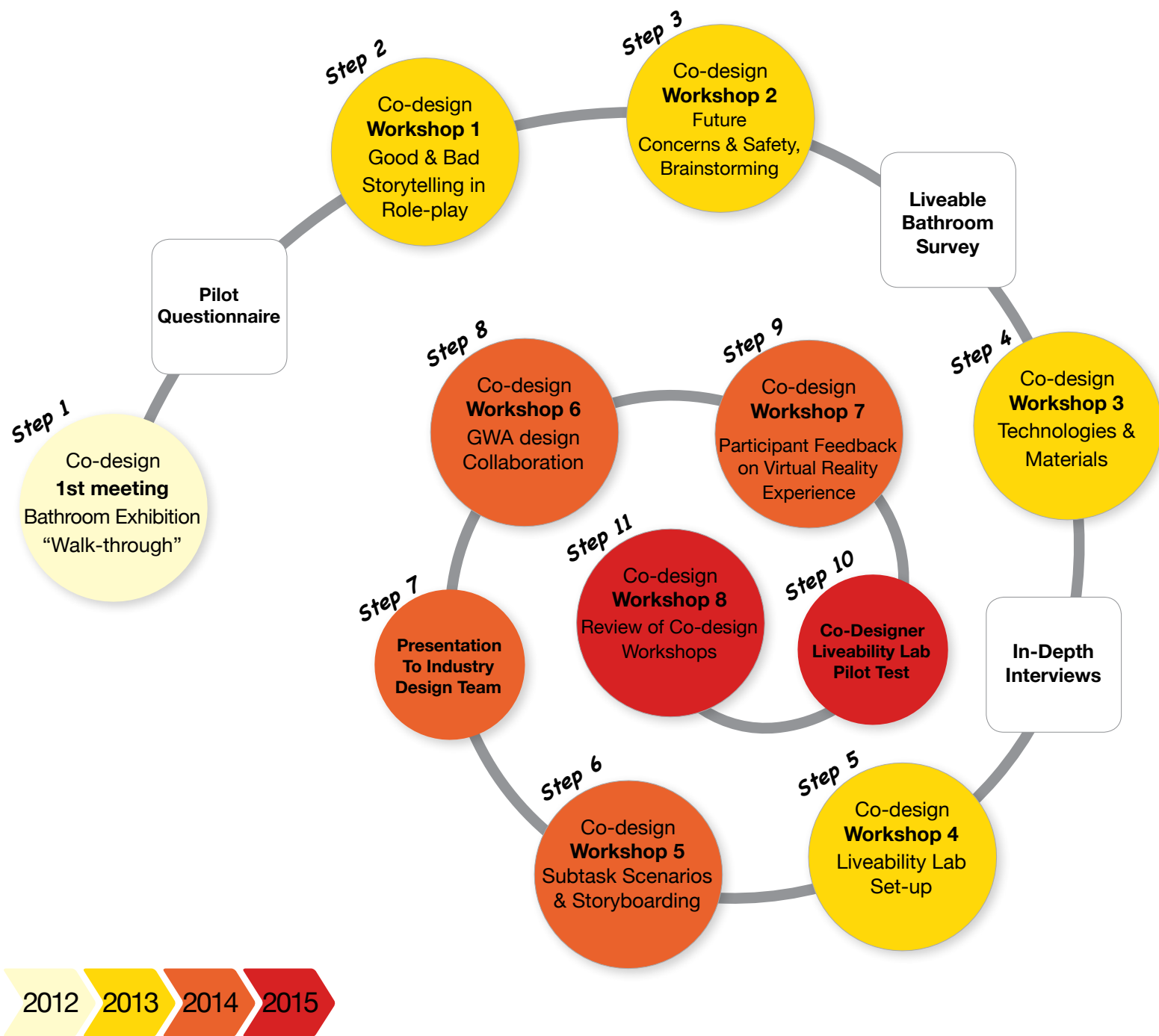


Figure 1. Diagram summarizing the various steps of the Co-Design sessions and workshops where the Co-Designers had different levels of input within the overall *Liveable Bathrooms for Older People* Project.



Co-Design Findings

The findings of each step of the Co-Design process were collected and compiled into themes. The findings were collected during each of the sessions from post-it notes, sketches, recordings and video footage, as well as from discussions during the post workshop lunches. If the researchers were in doubt, or missing information, the Co-Designers were contacted via email or telephone. On a few occasions, Co-Designers even sent information on their own initiative, of things they deemed useful to the research team. This process has provided an interactive and collaborative approach to the data collection.

Method of Co-Design data analysis

An action-based approach has been taken with the Co-Design research, see (Figure 2. Stages of Co-Design Data Analysis). The Co-Design group have been actively involved in assessing and collaborating with the research team to determine the findings of each of the workshops. .

After each workshop the Co-Designers were sent a summary of the workshop outcomes and findings (stage 1) and were encouraged to consider them and provide feedback in order to confirm consensus among the group. Prior to the final session the findings from all the workshops were collated, the key themes were identified (stage 2) and then mapped logically (stage 3). In the final session the Co-Designers were presented with these findings and given the opportunity to comment and make changes (stage 4) before the analysis was finalised (stage 5).

Unlike traditional qualitative research methods, where data is collected and subjects analysed independently by the researchers, the Co-Designers took an active role in generating the outcomes of each session and the project as a whole. This provides an efficient outcome focussed approach, minimising the amount of analyse required after each session.



Figure 2. Stages of Co-Design Data Analysis

Key Issues Identified in the Bathroom

Bathroom issues, and potential solutions to them, were compiled from the workshop sessions 1 to 5. These findings have been categorised as fixtures, bathroom environment and other findings. For more information on the specific outcomes of each session, refer to the section on individual workshops (Co-Design Workshops).



Figure 3. Some of the post-it note outcomes from Workshop 1.

Fixtures

Bathtub

The bathtub was perceived as hazardous for older people. Getting in and out of the bathtub was discussed and found to be particularly unsafe and difficult. Stories were shared of friends and relatives being stuck in a bath and unable to get out. None of the Co-Designers took baths anymore due to the difficulties and risks involved. Use of the bath was only discussed in terms of bathing grandchildren when they were young.

Because it was not used, the bathtub was viewed as a waste of space. This was seen as space that could be better used for storage or for a larger showering area that would allow wheelchair access or room for a shower chair if needed.

The main idea for solving the problem of the bathtub was to get rid of it entirely. However, the Co-Designers were aware that many people still wanted to use the bathtub, or keep it for family, guests or resale value. Other ideas for how a bathtub could be made more practical or useable were discussed. For practicality, the Co-Designers proposed a space-saving bath that could be folded away or be fitted with a moveable vanity on top of it. In terms of usability, a low profile bath that was easier to get in and out of was suggested.

Table 2: Bathtub Issues and Ideas

Issues	Ideas
• Dangerous to use • Takes up lots of space	• Low profile (easier to get in/out) • Get rid of it • Space saving (Folding or vanity over bath)

Shower

As a necessary bathroom component, issues with the shower for ageing in place were discussed at length. These can be categorised into issues about space, falling hazards, support and storage.

Space:

The space to comfortably use the shower was discussed at length. This included the reaching distance to access water controls which were often in inconvenient locations, forcing people to get wet or be unbalanced reaching around for them. The entrance space was also discussed, with shower screens, especially the articulated ones, being problematic. Not only was the opening deemed too narrow for larger people, the articulated screens were perceived as having a tendency to stick or be tricky to open and leading to the possibility that people could get stuck in the shower. Once in the shower, the adequate space to comfortably wash was also seen as often insufficient to move around, especially to wash feet. This was also discussed as relevant to the need to get a wheelchair or shower seat into the shower.

The main ideas proposed concerning space were to provide a larger shower recess without a screen and effective drainage. Shower taps were to be placed so that they could be reached from outside the shower area to avoid getting wet. Voice controlled shower flow and temperature was also suggested. To increase ease of washing, adjustable shower heads, hand-showers, and a foot rest for washing feet were proposed.

Tripping and Falling:

Hobs were seen as a trip hazard, even if they weren't very high. One Co-Designer said she often had to remind herself to "pick up your feet, girl" as she wouldn't even be aware that she was shuffling. Hobs also were seen as an issue if a wheelchair was needed. Slipping was identified as a concern and with the slip resistance of shower flooring being the key factor, as well as water retention.

The main solutions around tripping and falling were to remove the hob altogether, to have good water drainage to minimise puddles and slip resistant material on the floor, both in and out of the shower.

Things to grab:

Part of the issue with falling was the lack of grab-able support, such as grab rails. The Co-Designers discussed grab rails, the lack of them in the shower as well as the lack of space to put them in many showers. The solution to this was to have fixtures double as grab rails, particularly the shower rail.

Storage:

The lack of space in showers was also discussed as it affected the storage of products, like soap and shampoos. The lack of storage in the shower was seen as especially problematic for older people, as the option of placing items on the floor would cause them to be too difficult to retrieve. Storage solutions discussed included storage shelves which could double as grab rails.

Other shower issues:

Having a pleasurable shower was also discussed. A nice feeling shower was important and the Co-Designers liked a large shower head and rain shower. There were also discussions around speedy showers, with multiple shower spouts for a quick clean and ideas about air drying (with a Dyson-like air dryer) instead of having to use a towel.

Table 3: Shower Issues and Ideas

Issues	Ideas
• Hobs: Hard when arthritic, have to step over hob (no good for wheelchairs. • Too small: Hard to move around or clean your feet. • Shower doors (especially sliding ones) too small to get in and can get stuck. • Nowhere to put soaps/products • No grab rails/things to grab onto.	• No hobs • Large shower space • Shower taps offset and reachable without getting wet • Voice controlled shower flow and temperature • No shower doors • Proper water drainage • Adjustable shower head • Foot rest for washing feet • Shower fixtures to double as a grab rails. • Shower head on hose • Nice feeling shower (rain shower) • Multiple shower spouts to clean all over quickly • 'Dyson' dryer to dry body in shower.

Toilet

The toilet was discussed frequently as a necessary part of the bathroom. Discussions about the toilet centred on space, toilet height, toilet seats, location of toilet paper and noise.

Space:

Again, space around the toilet was a big concern to the Co-Designers for a few reasons. Firstly, having enough space to sit comfortably was discussed, this was even more important when considering ageing and future requirement to install grab rails. Anna, for example, did not have enough space to have a grab rail installed if she needed one and this worried her. Another worry was falling into the small space next to the toilet and getting stuck. This was a scenario some of the Co-Designers were aware had occurred to friends or relatives.

The solution proposed to this was to ensure there was adequate space between the toilet and the adjacent wall to allow installation of a grab rail so that a person would be unlikely to get stuck in it.

Height:

The difficulty getting on or off a toilet was discussed, especially at specific times, such first thing in the morning when the person using it was stiff and had reduced mobility. It was felt that the ideal height of the toilet for use and transferring would vary with the size and ability of the person. In addition to the provision of grab rails, the idea of an adjustable toilet height was proposed.

Seats:

The design of the toilet seat was seen as important to provide an adequate support area so as not to 'pinch' the user. Some of the modern very narrow and rectangular seats were brought up as being particularly uncomfortable. A wider and rounder seat that accommodated larger and heavier people was felt would be more comfortable.

Reach:

The location of toilet paper was very important. The Co-Designers discussed how difficult it was to reach behind them to access toilet paper, especially when the toilet paper was located on the back wall. Strategies to overcome this, such as placing the roll on the edge of the bath/vanity, or in a basket next to the toilet, were discussed as workarounds. One solution to overcome this was to have toilet paper on a stand that could be placed in the optimum position for the user. It could also double as a support. Alternatively, the incorporation of a bidet within the toilet or toilet seat was proposed as a solution to cleansing.

Noise:

The noise of the toilet flushing and water running through pipes was considered problematic particularly at night time. Waking up others was thought to be inconsiderate, especially to neighbours in apartment buildings. Quieter flushes and noise-insulated pipes were seen as a solution.

Other toilet issues:

Cleaning and water use were also discussed and will be covered in more detail later.

Table 4: Toilet Issues and Ideas

Issues	Ideas
• Lack of space around toilet • Bad positioning of toilet paper • Noisy flushes (apartments) • Uncomfortable toilet seats • Difficult to get on/off if stiff	• Adjustable toilet height • Self flushing • Bidet • Toilet roll on stand • Low water use

Washbasin/Vanity

The vanity or washbasin area was discussed in terms of space and storage, water management and activity needs.

Space and Storage:

Space was discussed mainly in terms of storage, or lack of storage. Space was discussed both as places (drawers preferably) to store bathroom products as well as counter space to place items such as soap/ hand wash and products being used frequently. Having a basin on one side, as opposed to the centre of a vanity was proposed as a way of having more useable counter space.

Water:

Splashing and water management was seen as problematic. The positioning of the spout was important for preventing splashing. Making sure the sink did not overflow was also important, particularly in apartment living. Having overflow drains was seen as important features that were seen as often no longer available. Co-Designers felt that easy to use taps were important although the group did not like mixer taps or lever type taps as they felt they were difficult to adjust.

Activity needs:

Besides having enough space to place items being used (such as shaving products), provision of lighting and power points were also seen to be insufficient. Better, smarter lighting was proposed as a solution, coupled with smart mirrors (detailed below).

Table 5: Washbasin/ vanity Issues and Ideas

Issues	Ideas
• No overflow drains. • Location of faucet too close to edge- splashes water at you. • Not enough power points	• Movable faucet • Easy to use taps (not into mixer taps or long handled taps) • Sensor taps with regular settings (also adjustable)

Mirrors

Mirrors were considered important not only for seeing one's reflection, but also in making the room seem lighter and brighter. Some of the issues around the mirror were inconvenient location, especially with regards the placement of adequate lighting to perform fiddly activities, such as applying contact lenses or make-up.

Some of the solutions discussed were to have lighting incorporated in the mirrors as well as smart mirrors, which incorporated touch screens and cameras which could include functions that would help track health indicators. A capability to monitor the appearance of moles over time was seen as particularly important.

Table 6: Mirrors Issues and Ideas

Issues	Ideas
• Inconvenient locations • Low or bad lighting	• Better lighting • Possibility to incorporate smart technology – track moles and health over time.

General Storage

Storage was frequently discussed as insufficient. This included both temporary storage, like hooks, for items such as clothing, towels and robes, as well as permanent storage, such as drawers and cupboards. Deep cupboards were seen as especially difficult for older people as they involved bending and reaching. Drawers were preferred.

Most of the Co-Designers had overcome the lack of storage by adding extra storage solutions, such as plastic corner shelves, or having a stool they could put clothes on.

Table 7: Storage Issues and Ideas

Issues	Ideas
• Never enough storage • Deep cupboards are inaccessible.	• Somewhere to hang hairdryer. • Under vanity storage drawers. • Hydraulic shelves – can pull down to suitable height



Joy's main bathroom

Bathroom Environment

As discussed in the previous section concerning specific fixtures, the overall bathroom environment is an important factor in determining whether there are issues of concern for older people. The elements that had the most impact on bathroom use were space, access, ventilation, lighting and flooring.

Space

Space was the most frequently discussed issue with the bathroom and affected every fixture and activity.

Adequate space did not have to be excessive. It was about meeting the size needs of the people performing the activities that mattered. In the shower, the space needed to be enough to bend over to wash feet as well as bring a shower chair or wheelchair into it. Toilets needed to have enough space to place a commode over them, install grab rails and large enough not to get stuck between the wall and the toilet. Circulation space within the bathroom had to be sufficient to allow the use of a wheelchair.

Other concerns for space were storage, accessibility of fixtures in order to clean them and space to have a stool or chair in the bathroom for support.

Table 8: Space Issues and Ideas

Issues	Ideas
• Not enough space to put stuff on vanity • No space to clean some areas of the bathroom • No space around toilets to fit a commode or grab rails • No space for stools/chairs in bathroom • Nowhere to put your clothes when you undress • Small showers	• Bath removed or with other purpose when not in use • Long vanity bench or basin on one side to maximize usable space

Doors and Access

Access to the bathroom was seen as problematic as doors were often too narrow for wheelchair access. Another major concern was the door opening inward, which was a concern if someone had an accident and blocked the bathroom door, which would prevent help from getting to them. Locking bathroom doors was also a concern if the person in the bathroom got into trouble. The Co-Designers did not lock their bathroom doors for that reason.

Different types of doors, sliding, swinging outward or even automatic, were proposed as possible solutions.

Table 9: Doors and access Issues and Ideas

Issues	Ideas
• Entry often too small for wheelchair • Doors open inwards – problem if someone has collapsed and is blocking door. • Locking doors can be a problem if someone in trouble.	• Doors that swing in or out –so you could get to person inside. • Sliding door • Automatic and larger doors

Ventilation

Good ventilation is viewed as important, especially in helping to prevent mould. The Co-Designers were concerned that many apartment bathrooms do not have windows. This was also seen as a worry if calling for help if they could not open the door. Being able to control fans was also discussed, with some of the Co-Designers hating having the fan go on automatically with the light.

Table 10: Ventilation Issues and Ideas

Issues	Ideas
• Lack of windows • Insufficient ventilation means more damp and more mold • Fogs up mirror	• Windows that open • Powerful extractor fans (separate from light) • Fogless mirrors

Lighting

Appropriate lighting was seen as important depending on the activity being performed. The Co-Designers discussed prevalent lack of lighting for grooming and the need for the right location of the light for grooming. Additional lighting was increasingly important as people aged and experienced reduced visual function. The placement of switches was also discussed as often not being accessible from wheelchairs.

Some of the ideas for improved lighting were to have more task lighting around the vanity/mirror, automatic on/off sensor lighting. Another solution was to have lighter surfaces to reflect light and show dirt, making it easier to clean.

Table 11: Lighting Issues and Ideas

Issues	Ideas
• Not enough lighting for grooming. • Down lights not in the right spot for putting on makeup. • Switches not accessible from wheelchair height.	• More even lighting. One in center, one over basin. • Lighter surfaces preferred for aesthetics and to allow older people with poorer vision to see dirt. • Mirrors to reflect light and make room brighter. • Light automatically turns on on entry.

Flooring

The material of the floor was discussed as the Co-Designers felt tile flooring was often slippery when wet, as well as cold. Ideas about non-slip flooring were discussed and the Co-Designers were very interested in some of the flooring material shown in workshop 4 about materials and technology. They liked the rubber flooring for its soft and warm properties and colour options. They were also intrigued by properties of the porous brick, which would never form puddles.

Table 12: Flooring Issues and Ideas

Issues	Ideas
• Tiles are slippery • Hard to clean grout • Puddles of water can be dangerous • Hard and cold surfaces	• Non slip surfaces • Softer materials



Penny's main bathroom

Other Findings

Cleaning

Cleaning was discussed in terms of every aspect of the bathroom. Many shower and grooming routines factored in cleaning at the end of the activity. Difficulty cleaning was a problem for the Co-Designers, especially when it involved bending, reaching or hard to reach areas. Mouldy grout was brought up frequently.

Some of the solutions for making cleaning easier were to have enough space around the fixture as well as fewer crevices and areas to collect dirt and dust. Following the materials and technology workshop (5), other solutions, such as self-cleaning fixtures and materials were explored.

Table 13: Cleaning Issues and Ideas

Issues	Ideas
• Hard to clean some areas • Grout gets mouldy • Corrosion in bathroom.	• Self cleaning fixtures and materials. • Grout that never gets mouldy • Lotus effect on all surfaces • Self cleaning toilet (eco friendly)

Reach

As discussed above, bending and reaching were discussed as concerns with ageing as they would become increasingly difficult, especially if confined to a wheelchair. The location of fixtures and items in easily accessible locations was proposed as a solution.

Table 14: Reach Issues and Ideas

Issues	Ideas
• Difficult to reach to the back of deep shelves. • Difficult to reach shower taps or basin from wheelchair. • Difficult to reach toilet paper roll if on back wall.	• Drawers or shallow shelves • Taps and toilet paper in easy to reach locations • Wheelchair accessible switches and controls

General Findings

Other general bathroom issues were discussed, namely focusing on safety and energy/water consumption.

Safety:

The Co-Designers spoke about falling in the bathroom and some of the features that could make it worse. These included many issues previously addressed including calling for help if there was no window, accessing someone trapped in a bathroom if the door opened inward.

Some other concerns were about the ability of the environment to cause harm during the event of a fall. The lack of grab-able surfaces and fixtures was an issue as well as the form of the fixtures. Projecting, hard and sharp surfaces were viewed as a problem as they could cause serious harm. Some of the solutions proposed were to have rounder edges, softer materials and for everything to be grab-able.

Energy and Water:

The Co-Designers were very concerned about wasting water and electricity. These were environmental and financial concerns.

Some of the solutions proposed were having automatic, location specific sensor lighting, as well as water-saving toilets and showers.

Table 15: General Issues and Ideas

Issues	Ideas
- Concerns about energy and water usage - No handrails - Projecting hard corners and hard surfaces	- All fixtures to double as grab rail (like towel rails) - Softer materials and rounder edges - Water saving fixtures - Automatic sensor lighting

Aesthetics:

Fixtures and bathroom environments were often discussed in terms of aesthetics. Modern bathroom design was appreciated, as was luxurious bathroom spaces. Hotel bathrooms were often used as examples of good bathroom design. They were considered luxurious with hardwearing, long-lasting fixtures.

Newer fixtures such as mixer taps and lever tap designs were discussed but there was no consensus on preference. Aesthetics for older people, much like those of younger generations are personal preferences, however, the emphasis on fixtures and the bathroom environment looking good as well as being supportive was unanimous.

Summary of Key Themes

The Co-Designers felt that the bathroom environment poses a lot of problems for older people ageing in place. The main issues in the bathroom were in regards to:

- **Safety** – making sure the environment is safe for older people and helps to prevent accidents. If an accident occurs, the environment should not cause additional harm and should help enable easy access.
- **Supportive and comfortable** – the bathroom environment and fixtures should allow and support older people to perform activities with ease. This includes providing adequate space, ample support, easy reach and access, adequate lighting and comfort while carrying out bathroom activities.
- **Easy Cleaning** – The bathroom environment and fixture design should reduce the amount of cleaning required through good ventilation, lighting, smooth surfaces and easy access.
- **Allow for other needs** – the bathroom environment should be accessible to everyone, including children, carers and people with disabilities. There is a need for flexibility and products that can adapt Wheelchairs and other supportive equipment must be accommodated.
- **Aesthetics** – The bathroom should look good, and the fixtures and features should be aesthetically pleasing as well as being functional and supportive.

THE FUTURE - YOUR BATHROOM IN 2025

Have a think about the bathrooms in your house. Can you imagine any problems or concerns you or someone else might have in **10-15 years** time?

Things you could potentially look at:

- Dangerous activities or actions
- Dangerous areas or things (objects, fixtures, etc.)
- Uncomfortable or problematic activities or actions
- Uncomfortable or problematic areas or things
- Activities that might be difficult or impossible to do

Please do the following activities and bring your booklet with you to the workshop.

1. Look around your bathroom(s) and identify 5 activities, actions, areas or 'things' that you think might be a pose problem in 10-15 years.
2. Take photos, if possible, of the problem areas or 'things' you have identified. Bring these photos or your camera to the workshop (we will have a printer ready to print them out).
3. Fill out the pages provided in this booklet with a short explanation of *what* the activity, action, area or thing is, and *why* might be a problem or concern in 10-15 years time.
4. Ranking: number these identified future problems from 1 (most problematic) to 5 (least problematic) in the order of your choice.

Remember, there are no right or wrong answers!

Top 3 concerns for the future

For the second Co-Designer workshop (STEP 3 - Co-Design Workshop 2: Future Concerns & Safety and Brainstorming), the Co-Designers reflected on the possible concerns they might have with their bathrooms in 10-15 years time. These concerns were ranked and discussed in two subgroups. Following this the top 3 concerns for the future were selected and agreed on.

The main concerns in the bathroom were around falling, including the lack of grab rails as well as trip and slip hazards, accessibility and space. The top 3 concerns were identified as:

Lack of space

Lack of space was seen to impact access, cleaning, toilet use and showering. The Co-Designers felt that the space should be adequate for larger people and wheelchair users to perform activities in the bathroom comfortably.

Lack of level flooring

Uneveled flooring, especially shower hobs, meant that the bathroom would not be accessible if in a wheelchair. It would also make it easier to trip over due to shuffling or stiff movements.

Lack of grab rails

The lack of grab rails in the Co-Designers' bathrooms would impact their ability to use the space safely in the future. The Co-Designers felt that all fixtures should double as grab rails

Unexpected Findings

Through out the Co-Design workshops, the Co-Designers input challenged previously held assumptions about older people. The main unexpected findings the researchers found were their acceptance of change and environmental concerns.

Technology in the bathroom

The Co-Designers were very accepting of new technology and implementing it in the bathrooms. Once they were made aware of some of the possibilities (in workshop 2 and 3), the Co-Designers were very keen on using technology in the bathroom. In workshop 5 scenarios, where the Co-Designers 'designed' a bathroom around a specific scenario, both sub-groups used sensor technology to control many key elements, from lighting to toilet use. The Co-Designers were also keen to use technology in the bathroom for health purposes, such as smart mirrors to check moles.

New materials and fixtures

Similar to technology, new materials were readily adopted once the Co-Designers had been made aware of their potential. With the scenario activity, many of the bathroom fixtures were self-cleaning, using lotus-like super hydrophobic coatings and materials to remove the need for cleaning. Bidet toilets were also adopted.

Environmental concerns

The Co-Design group took environmental issues seriously and were very aware of water and electricity use. Toilets and showers were often discussed in terms of water usage. To a lesser extent, energy usage was also discussed.

Consideration for others

The Co-Designers were very aware of different people's needs from all stages of life and ability. They were conscious to include others when discussing activities, fixtures and potential solutions. This included making sure friends and family members were comfortable, and that people could care for their children and grandchildren.



Guiding Principles

From the Co-Design findings from all workshops, guiding principles have been outlined to help design for older people.

1. Level Surfaces

All floor surfaces should be level to reduce tripping hazards and to allow for wheelchair access, if needed.

2. Easy to Clean

The bathroom environment and bathroom fixtures should be easy to clean for older people with limited ability to bend and reach. Smooth surfaces, easy access and enough space to get cleaning tools into are important.

3. Appropriate Space

The space needs to allow for people of different sizes and users of assistive technology to move comfortably within the space, while still being practical. The space around fixtures should not create areas where a person can fall into and get stuck.

4. Convenient support

Anything that can be held, or used as a support should be one. For example, towel rails, shower rails or basins.

5. Convenient and comfortable Seating

The space needs to allow for seating and fixtures that can be sat on should be designed so that they can be sat on comfortably. This includes designing toilet seats to be comfortable.

6. Convenient Storage

Storage should fit the users needs and activities and it should be easy to use and access.

7. No features that could cause injury

Nothing in the bathroom should cause harm to a person. Nothing should cause an injury or cause further harm to a person if they were to have a fall. Corners should not be sharp and surfaces should be non-slip and soft, if possible.

8. Comfortable, convenient and intuitive controls

The location and use of controls should be convenient and easy to use. This applies not only for the person who installed them, but for guests and relatives as well.

9. Adaptable Lighting

Lighting should fit the activity and the individual's needs. For example, nighttime lighting should not be the same as lighting for grooming.

10. Comfortable climate

The bathroom should be at a comfortable temperature to help reduce stiffness and discomfort. Comfortable climate also takes into consideration adequate ventilation to reduce damp.

11. Appropriate acoustics

The bathroom and bathroom fixtures should make minimal noise so as not to inconvenience other people.

12. Supportive luxury

A comfortable and supportive bathroom should not lose its desirability for everyone. Creating supportive bathrooms should be about increasing ease of use, enjoyment and sense of luxury for everyone.

“What is necessary for us is a luxury for the younger ones” *Anna*

IDEAS

NO CERO
HIL
COCORO
TRALTY

SORREL
CONE
FRANCY

CHIEF
HIL
HAW-IL
YRAC

SEANNA
THINGS
FOR
SEANNA

NO CERO
HIL
COCORO
TRALTY

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Co-Design Workshops

This chapter explains step-by-step the livable bathrooms Co-Design research undertaken from the end of 2012 to May 2015. The Co-Design research has been a key component to the Livable Bathrooms project and has helped to guide research method, provide ‘expert’ insight into bathrooms for ageing in place. Each step of the Co-Design process undertaken and the key findings from every session are outlined in this chapter. Following the sessions, a reflection of the livable bathrooms Co-Design experience well as some of the limitations and future improvements to the process will be discussed.

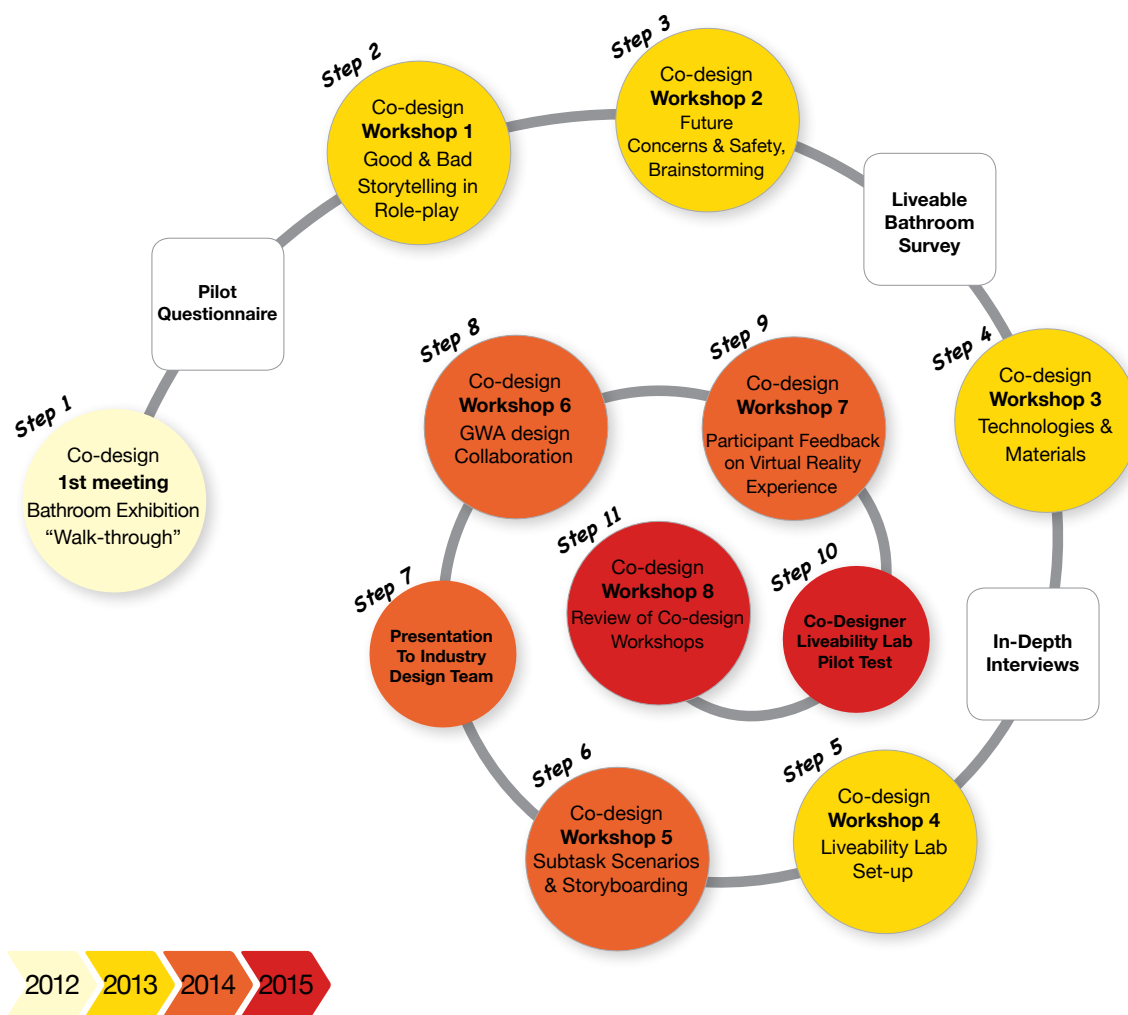


Figure 4. (Figure 1) Diagram summarizing the various steps of the Co-Design sessions and workshops where the Co-Designers had different levels of input within the overall Livable Bathrooms Project.

Figure 4 shows the Co-Design involvement from 2012 to 2015. Each Co-Design involvement is colour-coded by year, and shown in conjunction to the other Livable Bathrooms research that was carried out over the same period.



Discussing Marc Newson Collection - First Co-Design Session

STEP 1– First Co-Design Session

Marc Newson Collection Exhibition Walk-through

September 5, 2012

Boutwell Draper Gallery, 82-84 George St Redfern

Researchers:

Steve Cummings
Katy Bridge
Oya Demirbilek
Alicia Mintzes
Steve Davey

Co-Designers:

Anna
Tony
Joan
Penny
Joy

Meeting the Co-Designers

This was the first session where we met our Co-Designers. After a chat about the project, Co-Design in general, and their role as Co-Designers, we proceeded with a walk-through exercise of the new Caroma Marc Newson collection. During this walk-through, each Co-Designer was paired with a researcher and was asked to give on the spot feedback of the items exhibited.

Following the walk-through, the Co-Designers were given a brief talk on the Livable Bathroom questionnaire being developed. The Co-Designers were informed about the objectives and content of the questionnaire and given a copy to complete at home as it is intended to be. The completed questionnaires with comments, feedback and advice were later mailed back to the research team.



Meeting the Co-Designers.

Walk-through

As their first involvement with the project, the Co-Designers were very comfortable with the task of walking through the exhibition, interacting with the products on display and providing their viewpoint on the various fixtures and features displayed. The Co-Designers were each paired up with a researcher and provided their feedback for the bath, sinks, toilets and showers.

The Co-Designers were very good at looking at the designs and discussing the positive and negative elements of each fixture. Overall, they discussed the designs in terms of their aesthetics, accessibility, safety, useful features, cleaning, cost, water conservation, practicality for all age groups, and how the products might fit into typical domestic bathroom environments.

The Co-Designers commented on specific features of the products displayed. They voiced preferences for particular fixtures within a product family, such as the moveable shower on a rail as opposed to the fixed one. They also provided additional design suggestions, such as automatically opening and closing toilet lids. It was felt that the fixtures would need a large bathroom space and that they would not fit into most typical home bathrooms. The Co-Designers were very conscious of all potential users and uses. They discussed how children might use the products, such as sliding down the side of the bath, or how a parent would have to bend over to wash a child in the bath.

Overall, the Co-Designers commented that the exhibited products were for a luxury market and were “designed for young people”. They did not feel that most of the products were designed with ageing and the needs of older people in mind.



Images from the Caroma Marc Newson collection exhibition walk-through.



Discussing Marc Newson Collection - First Co-Design Session

Livable Bathrooms Questionnaire

The Co-Designers were provided with a draft questionnaire to fill out and provide feedback on. The completed questionnaires contained feedback on content relevance, question options, structure, ease of answering, and overall layout. This was reviewed and discussed at the next workshop and feedback and advice incorporated into the questionnaire. Using the Co-Design group to complete a draft questionnaire was useful for continuity and previous knowledge. The Co-Design feedback after completing the draft questionnaire was valuable as it allowed for more in-depth insights.

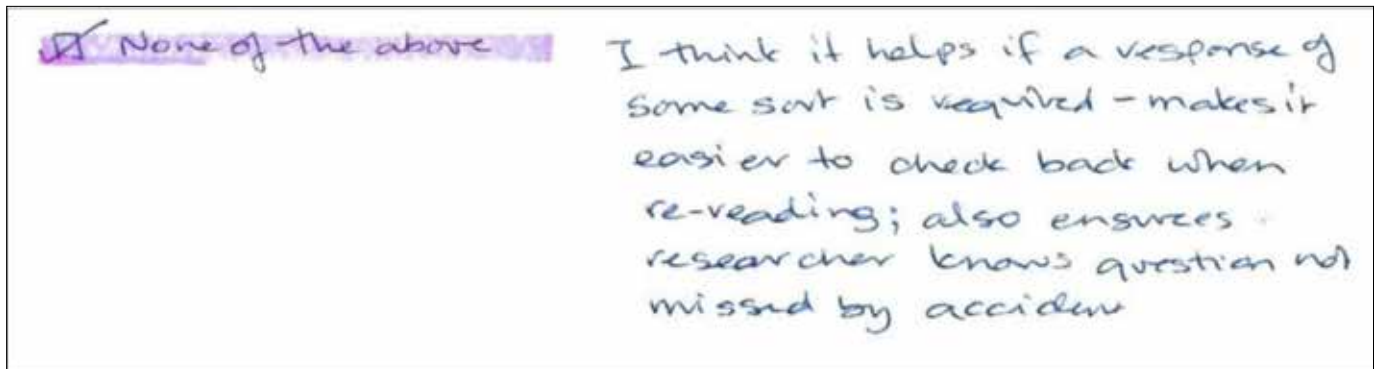


Figure 5. Example of response option feedback

The completed questionnaires were very valuable in uncovering issues with the question options. Co-Designer advice and feedback was often given as direct comments, such as the need for ‘no’ or ‘not applicable’ response options (see Figure 5). Some comments provided information on the need for a different question or response categories. For example, in a question regarding cleaning, 3 out of the 4 Co-Designers selected multiple options and commented as to why more options were selected. In this case, it became apparent that cleaning involved multiple tasks that were often completed separately, thus requiring a completely different question and response options.

The information and feedback provided was important in the development of the Livable bathrooms Survey. Creating a dialogue between survey developers and older people was essential in generating better and more suitable survey instruments. Further testing of the survey items was then undertaken using a pilot survey and cognitive interviews.

First Co-Design Session: Outcomes

1. Walk Through

- Designed for a luxury market
- Considered use and practicality for all age groups
- Considered ease of cleaning, cost, practicality in existing bathroom environments, and water conservation
- Designed for younger, more able-bodied people

1. Questionnaire Feedback Summary:

- More options needed for closed questions
- Some of the activity questions needed to differentiate sub-activities
- More provision of 'none' or 'none of the above' options
- Some questions were confusing and needed re-wording



Working in groups - Workshop 1

STEP 2 - Co-Design Workshop 1:

Good & Bad (Storytelling in Role-play)

Preparation for workshop 1

Co-Designers were sent a booklet each (see Figure 6) in which they were asked three groups of questions, to help them make some observations, take photos and analyse their bathroom within the immediate context. They were asked to fill in the booklet and to bring it back for the first workshop, to be held in February 2013.

We used the booklet method because it was not feasible to visit each Co-Designer's bathrooms for observation and usability testing. This also allowed specific information to be shared within the Co-Design groups. Moreover, the booklets helped to reduce errors in recall of information and initiate discussions.

The questions in the booklet were as follows:

- Have a think about your bathroom(s): What do you like? What don't you like? Please take a few minutes to write these and any other thoughts down in the booklet provided.
- What is your bathroom like? Sketch a rough layout of your bathroom (or bathrooms, if you have more than one) in the enclosed booklet provided.
- If you can, take a few photos of your bathroom. If you have a digital camera, bring it with you to the workshop so we can print out the photos.

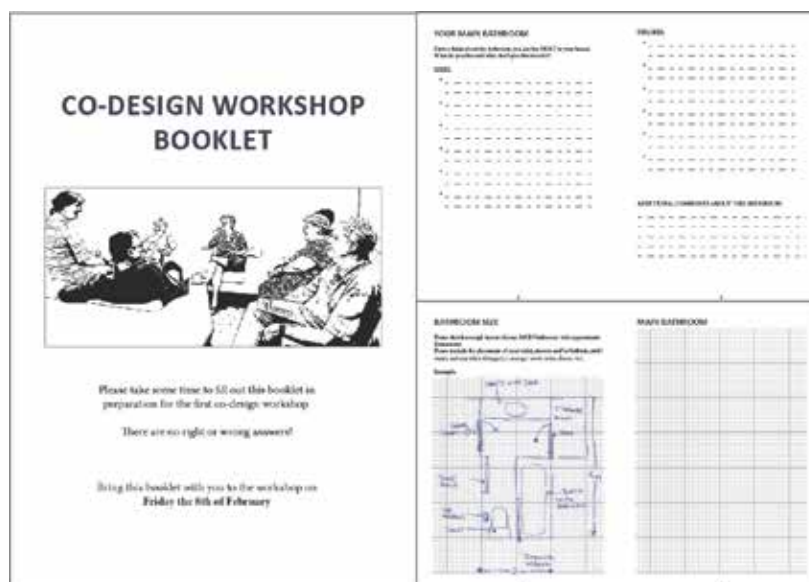


Figure 6. Pages from the booklet sent to Co-Designers

ANNA [1]
SMALL SHOWER
TOO SMALL FOR ASSISTANCE

[2]
TOILET
NOWHERE TO GRAB (TOILET)

[4]
LACK OF GRAB RAILS

CUPBOARDS
INSTEAD OF DRAWERS

[3]
SLIPPERY FLOORS

SHOWER SLIDING DOORS [1]

[2]
SHOWER HOB

[3]
POSITION OF SHOWER TAPS (TOO FAR)

[4]
POSITION OF TOILET (NO SPACE FOR GRAB RAIL)

PENNY [5]
SMALL SHOWER ACCESS

[6]
LOCATION OF SHOWER GOODS

NO GRAB RAIL IN SHOWER

RAY [1]
BATH (UNUSED)
UNSAFE

[2]
SHOWER TOO SMALL (SPACE + ACCESS)
TAP LOCATION HOB

[3]
VANITY TOO SMALL + HARD TO CLEAN

[4]
FLOOR TILES
GROUT WEARING GOT LOOSE
(TRIP HAZARD)

[5]
LACK OF STORAGE

Workshop 1: Good & Bad (Storytelling in Role-play)

February 8, 2013
Squarehouse, UNSW

Researchers:	Co-Designers:	
Oya Demirbilek	Anna	Tony
Alicia Mintzes	Penny	Joy
Steve Davey	Ray	Joan

The second time we saw our Co-Designers was during this first Co-Design workshop, where we introduced them to *storytelling* and *role-playing*. Before coming to the workshop, they all had been given (or sent) a booklet asking them questions about their bathrooms environment (as discussed in previous section, *Preparation for Workshop 1*).

Good, Bad & Ideas

In two separate groups of three, the Co-Designers first discussed what they entered in their booklet, and identified and discussed all their LIKES and DISLIKES. Both groups talked about the main concerns and problem areas in bathrooms, which were recorded on post-it notes (see Figure 7). The Co-Designers then discussed possible ideas to overcome the issues, which were also recorded on post-it notes.



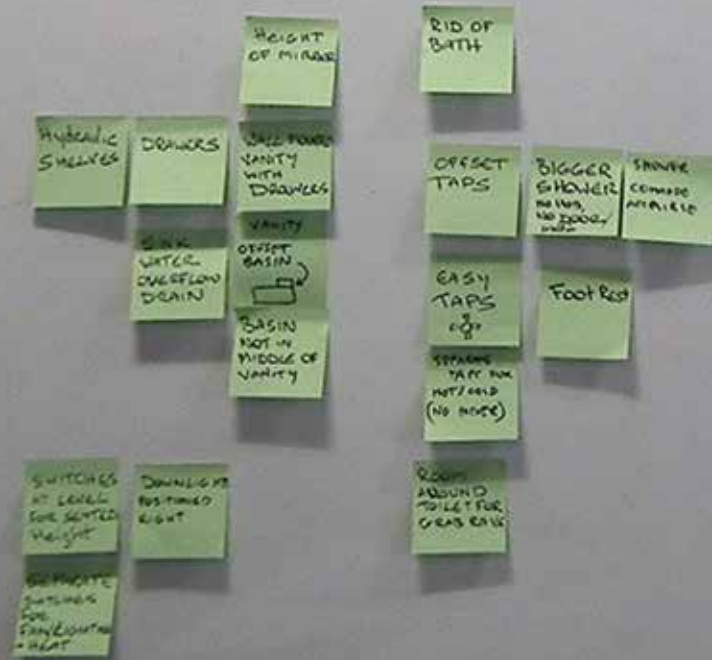
Good, Bad and Ideas discussions

Both groups independently identified similar likes and dislikes in the bathroom. The main dislikes identified through the discussions were elements that were perceived as dangerous and therefore unused and unneeded, particularly the bathtub. Other common dislikes or issues identified were related to locations of various fixtures or items that were difficult to reach, lack of space, tripping hazards, lack of desired storage and cleaning issues. Likes and ideas for improving bathrooms were also similar (see Table 16. Good, Bad & Ideas compiled from Group 1 and 2).

Table 16: Good, Bad & Ideas compiled from Group 1 and 2

Good	Bad	Ideas
• Grab rails • Good size space • Easy to reach fixtures and controls • Adjustable fixtures and controls • Good ventilation • Good lighting	• Lack of space • Trip hazards • Difficult to clean fixtures and areas • Difficult reach • Bathtub • Lack of storage	• No bath • Bright and easy to clean • Level flooring • Mould prevention • Separate controls (hot/cold and switches for light/fan/heat) • Larger spaces

Group 1



GOOD

BAD



GOOD

BAD



IDEAS



Group 2

Figure 7. Good, Bad and Ideas in the bathroom.

Storytelling

In order to uncover the Co-Designer's feelings and desires for the bathroom space, the final activity involved storytelling using dolls and models of bathroom fixtures to create a bathroom 'story' (Figure 8 and 9).



Figure 8. Storytelling

Similar to the discussions, the group was divided into two smaller groups and had to come up with a story around the bathroom with at least one good thing and one bad thing happening to the hero(s) in the bathroom. A table was set up with dolls, bathroom furniture and other props for them to use as they saw fit (see 9. Selection of dolls of all ages (Lundby), dollhouse furniture sets, and accessories used during a role-play activity).



Figure 9. Selection of dolls of all ages (Lundby), dollhouse furniture sets, and accessories used during a role-play activity

Both stories, again independently developed, centred on issues with the bathtub leading to injuries; the first group covered the issue of tripping and cleaning issues while the second group looked at tripping and difficulty with transfers and concerns with getting assistance after a fall. The solutions and positive outcomes involved changes to the environment to make safer and more pleasurable spaces for older people.

Workshop 1: Outcomes

Overall, the workshop successfully identified commonalities between older people in relation to domestic environments. The main themes that emerged after this first workshop were as follows:

- The **bathtub** was considered dangerous, and not needed
- **Comfortable reach** for everything was important (toilet roll, inside cabinets and drawers, etc.)
- There is **never enough space** (around bathroom furniture; in shower; on the surfaces, and as storage)
- **Hobs** and **screens** are problematic in showers
- There is a need for “**grab-able**” **things around** the bathroom, the shower in particular
- Need for a **flexible faucet tap arrangement** at the washbasin and apparent dislike of lever handle taps
- Good **ventilation** and mould prevention are important
- Good **area specific lighting** is important
- **Other activities** are also done in the bathroom, like drying clothes



Anna and Tony's en-suite

STEP 3 - Co-Design Workshop 2:

Future Concerns & Safety and Brainstorming

Preparation for workshop 2

Before coming to this second workshop, Co-Designers were mailed a second booklet asking them more questions about their bathrooms environment. The questions in the booklet were as follows:

Have a think about the bathrooms in your house. Can you imagine any problems or concerns you or someone else might have in 10-15 years time?

Things you could potentially look at:

- Dangerous activities or actions
- Dangerous areas or things (objects, fixtures, etc.)
- Uncomfortable or problematic activities or actions
- Uncomfortable or problematic areas or things
- Activities that might be difficult or impossible to do

Please do the following activities:

1. Look around your bathroom(s) and identify 5 activities, actions, areas or 'things' that you think might be/or pose a problem in 10-15 years.
2. Take photos, if possible, of the problem areas or 'things' you have identified. Bring these photos or your camera to the workshop (we will have a printer ready to print them out).
3. Fill out the pages provided in this booklet with a short explanation of what the activity, action, area or thing is, and why might be a problem or concern in 10-15 years time.
4. Ranking: number these identified future problems from 1 (most problematic) to 5 (least problematic) in the order of your choice.

Workshop 2: Future Concerns & Safety and Brainstorming

May 10, 2013

Squarehouse, UNSW

Researchers:	Co-Designers:	
Oya Demirbilek	Anna	Tony
Alicia Mintzes	Penny	Joy
Steve Davey	Ray	Joan

For the second Co-Designer workshop, the Co-Designers all brought the completed booklet about future concerns in the bathroom (please see previous section for details). All but Joan, who did not have a camera, brought in photos of their bathrooms to help with the workshop activities.

Future concerns

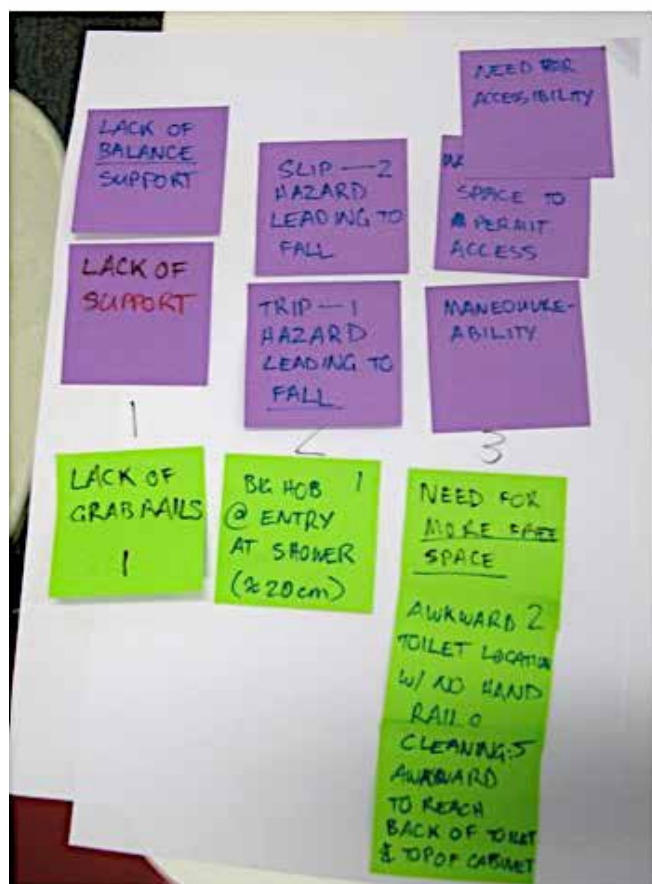
During the workshop, within two subgroups, Co-Designers talked about their bathrooms using their own photos. Future concerns were explained and given a ranking. The group members then decided on the top 3-5 concern areas, activities or things within their group (See image below for images of preliminary boards, then refined tables).

Once all was recorded in post-it notes and re-organised, we went on to identify the main themes and the top concerns and problem areas (see Figure 10). Each group then discussed their findings with everyone.

The main top concerns in the bathroom were around falling, including the lack of grab rails as well as trip and slip hazards, accessibility and space. The top 3 concerns were identified as:

- **Lack of space**
Impacts access, cleaning, toilet use and showering.
Space should be adequate for larger people and wheelchair access
- **Lack of level flooring**
Especially shower hobs – not accessible if in a wheelchair and easy to trip over if shuffling or stiff
- **Lack of grab rails**
Impacts the ability to use the space safely. All fixtures should double as grab rails

Both groups had similar concerns and the top 3 issues were similar for all 6 Co-Designers and were mostly surrounding the shortcomings or issues with the shower, and the lack of support there (such as grab rails). This included discussions on the lack of space, both to get into the shower (problems with shower hobs) and also within it (banging into fittings). This was seen as a problem for most. Grab rails (and the lack of them) were also rated high as issues, especially around the toilet and in the shower.



Group 1



Group 2

Figure 10. Identification of the top concerns and problem areas in the bathroom

Interestingly, the bathtub did not feature in any of the future concerns. This was most likely due to Co-Designers no longer using it, and therefore it was no longer a hazard.

Brainstorming

Future Concerns was followed by a brainstorming exercise where all wild ideas were allowed. This exercise consisted of generating as many ideas or solutions to the top three concern areas, activities or things identified in the first activity. Within the two subgroups, the brainstorming session brought up a variety of interesting ideas and concepts to help solve issues in the bathroom. Table one gathers all the ideas Co-Designers came up with during the session.

The brainstorming activity generated many ideas around different features and activities in the bathroom. The ideas discussed centred on the following main themes below:

Main themes:

- Adjustable bathroom fixtures to suit the person's needs
- Different methods of controlling the environment: voice, touch, gesture and sensors
- Automatic features: lights and level of lighting, water on/off
- Self-cleaning elements to reduce decay, mould and need to clean bathroom
- Temperature control
- Slip/fall prevention: non-slip flooring, always dry flooring, grab rails
- Multi-purpose fixtures: grab rails as towel rack or shower adjuster, vanity/bathtub
- Increasing amount of space: smart storage solutions, recessed or 'hidden' fixtures

Some limitations to the brainstorming activity were noted and had to do with this being the first time many Co-Designers had taken part in such an activity.

We explained to our Co-Designers that technology and material advances have enabled many new methods of doing and designing places and fixtures. We also clarified with them that the *Livable Bathrooms* project is interested in how some of these new materials and technologies can be used in the bathroom to create solutions that have never been possible before. We then stressed the importance for us to work with them as Co-Designers; to come up with new insight and ideas on how to solve some of the obvious and less obvious issues present in typical domestic bathrooms.

Unfamiliarity with new materials and technological advances in recent years led us to re-design Co-Design workshop 3 to focus on technology and materials.

Table 17: Co-Designers brainstorming ideas

Area	Idea
Bathroom	• Anti-slip tiles • Permeable flooring – never wet • Bench/drying spot • Recessed shelves • Shower adjuster doubles as grab rail • Combined towel/grab rail • Ceiling mounted storage
Shower	• Level access open shower (wet room) • Large rectangular space • Glass splash back • Multiple shower spouts to clean all over quickly • Drier in shower to dry body • Electronic shower screen to recess into wall • Shower ‘rug’ that soaks up water
Bath	• Folding bath • Vanity over bath (space saving) • Low profile bath
Adjustable features	• Cabinets to adjust to desired height • Auto adjust toilet for height and to assist getting up • Toilet that flushes when you get up • Open sesame door • Auto adjust lighting for lux levels • Lights on and off with entry/exit • Adjustable grab rails/towel racks
Temperature	• Customisable temperature • Voice controlled water temperature • Colour changing tiles with temperature • Electronic eye control for water in shower – right temperature always no need for tap • Glass touch temperature control for all heights • Sensor water control • Heated toilet seat and towel rails
Cleaning	• Waterless cleaning • Lotus leaf effect on all surfaces • Self-cleaning shower screen/splash back • Grout that never grows mould/something that ‘eats’ mould • Self-cleaning grout that lasts forever

Workshop 2: Outcomes

The workshop successfully identified common concerns for the future. It also identified the need to educate Co-Designers on materials and technological advances to enable them to fully contribute as Co-Designers.

Top concerns for the future:

- **Lack of space**
Impacts access, cleaning, toilet use and showering.
Space should be adequate for larger people and wheelchair access
- **Lack of level flooring**
Especially shower hobs – not accessible if in a wheelchair and easy to trip over if shuffling or stiff
- **Lack of grab rails**
Impacts the ability to use the space safely. All fixtures should double as grab rails

Brainstorming themes:

- **Adjustable fixtures** to suit the person's needs
- Different methods of **controlling the environment**: voice, touch, gesture and sensors
- **Automatic features**: lights and level of lighting, water on/off
- **Self-cleaning** elements to reduce decay, mould and need to clean bathroom
- **Temperature** control
- **Slip/fall prevention**: non-slip flooring, always dry flooring, grab rails
- **Multi-purpose fixtures**: grab rails as towel rack or shower adjuster, vanity/bathtub
- Increasing amount of space: **smart storage solutions**, recessed or 'hidden' fixtures

Other findings:

- The bath did not feature in future bathroom concerns, as it was no longer used.
- Unfamiliarity with new materials and technological advances limited the brainstorming possibilities and Co-Designer input. A more reciprocal approach to the Co-Designers is needed, where the researchers help to inform the Co-Designers of new and up and coming materials and technology.



Ray's bathroom



STEP 4 - Co-Design workshop 3:

Technologies and Materials

Advances in technology and material sciences have allowed for new ways of doing and designing things. However, they rarely make their way into the bathroom environment, at least into mainstream affordable ones. New technology and materials are important for the *Livable Bathrooms Project*, which is interested in applying them to design solutions to develop flexible and innovative bathrooms.

The purpose of the third Co-Design workshop was to familiarize our participants with some cutting-edge technological and material innovations now available that could be used to address some of the concerns about bathroom design identified in previous workshops. The research team believes that an awareness of what technology and materials are available will help inform the Co-Designers and the Co-Design process and as a result of it, the product development process too.

The materials and technologies demonstrated at the workshop are outlined below.

Materials

- Rubber flooring
- HydroSTON pavers
- D3O shock absorbent material
- Lotusan Paint (self cleaning)
- 3D printed materials (plastics, ceramics, metal and composites)

Technologies

- Leap Motion
- Nike+ Sensor Shoes
- Kinect and Virtual Environment
- Oculus Rift

Workshop 3: Materials and Technology

August 9, 2013

Squarehouse, UNSW

Researchers:	Co-Designers:	
Alicia Mintzes	Anna	Tony
Steve Davey	Penny	Joy
Peter Sweatman		Joan
Russell Lowe		

In small groups of two, Co-Design participants spent 15 minutes at various stations, where they were shown demonstrations of different materials and technologies and had the chance to ‘play’ with them, as well as ask questions. This was followed by a group discussion on all the technologies and materials presented. Participants voiced which ones they liked and how they could see some of these being applied/ work in the bathroom context.

Materials



Figure 11. Material Station

Materials were selected based on their relevance to the discussions and brainstorming session in workshop 2. The materials demonstrated non-slip properties, flexible to rigid material, self-cleaning paint and 3D printing technologies. The groups were given a demonstration and a chance to interact with the various materials and discuss their thoughts.



Figure 12. Explaining the properties of D30

The Co-Designers were very positive and interested in material development. They had not heard or seen many of them. Of particular interest was the self-cleaning materials, non-slip flooring and 3D printing process.



Figure 13. Examining 3D printed plastic and ceramic

Technology

The Co-Designers were invited to play with new technology based around sensor technology. These included walking in Nike+ Sensor Shoes (Figure 14), a virtual Kinect bathroom environment and playing with that virtual environment (with or without total emersion via Oculus Rift, see Figure 15).



Figure 14. Nike+ Sensor Shoes



Figure 15. Virtual bathroom environment

The Co-Designers enjoyed learning about new materials and technology and were not afraid to try out virtual environments. This was interesting as it defies many assumptions that older people are not interested in, or even afraid of, new technology.



Discussion about materials and technology

During the post session lunch, the use of technology in the bathroom was discussed in more detail, particularly in terms of the possibility of being continually monitored by sensors in the bathroom. The Co-Designers felt that education and benefit were central to increasing technology in the bathroom. Older people had to be informed and educated about the benefits. Moreover, limiting sensors so that they did not significantly infringe on privacy was also deemed important. Possible applications of materials and technology were also discussed (Table 18 and 19).

Table 18: Materials, their purposes and possible applications in the bathroom

Materials	Purpose	Possible Applications
Rubber flooring	Non-slip rubber flooring that is comfortable and absorbs walking noise.	• Warmer, more grip than conventional bathroom flooring. • The looks of new materials need to fit in with the domestic environment. • Would cushion falls and be warmer to lie on if waiting for help/having difficulties getting up.
HydroSTON pavers	Permeable concrete pavers that allow water to flow through them into the ground. Helps reduce stormwater runoff and improve water quality.	• Lots of grip and removes the issue of wet slippery surfaces, especially in the shower. • Possibility of removing problems instead of compensating for them. • The importance of new materials being easy to clean.
D3O material	Flexible material which, on impact, becomes rigid to absorb and disperse energy before instantly returning to its normal state.	• Interesting material and properties. • Reverse properties would be useful in the bathroom, especially with falls.
Lotusan Paint	Self-cleaning paint that replicates the effect of lotus leaves. A super hydrophobic material, it reduces contact area for dirt and water. Water rolls off it, taking dirt particles with it.	• Really exciting new material • Could be applied to many different situations and make cleaning a lot easier. • Some applications discussed: shower screens and glass, wall coverings. • Reduce the need for cleaning products.

3D printed materials	Prints 3D objects from a digital model. Can print many different materials, such as metals, ceramics and plastics.	• Customise fixtures. • Shapes are less constrained by manufacturing process.
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Table 19: Technology, their purposes and possible applications in the bathroom

Technology	Purpose	Possible Applications
Leap Motion	Tracking palm and finger movements using a sensor attached to a computer	• As a device for controlling a computer, was easy to pick up and understand. • Could be useful for arthritic people by removing need to grip and turn taps with natural motions.
Nike+ Sensor Shoes	Tracks pressure across the wearer's feet over time, and logs the information. Can be viewed on an iPad.	• Tracking balance and pressure over time could be used to predict falls.
Kinect	Tracks the user's body using a sensor connected to a computer, and follows how arms, legs, torso, and head are oriented and positioned.	• Range of motion could prove an issue for use in older people – needs to track subtle movements. • A higher resolution camera could be used to track moles and visible health issues. • Movable fittings could be easily customised to a broad range of people using the Kinect's ability to track body size and shape.
Oculus Rift	A virtual reality headset that immerses the wearer in a 3D environment. Wearing it, the user can look in any direction by moving their head.	• Feeling of being in a 3D bathroom environment was impressive. • Motion sickness and disorientation could be issues if this device were used for more than a few minutes at a time.

Workshop 3: Outcomes

The workshop successfully educated the Co-Designers on new materials and technologies, as well as provided them with more information on the goals of the Livable Bathrooms Project.

The outcomes of the session were:

- Increased knowledge and awareness about technology and materials available
- Increased understanding of the direction of the Livable Bathrooms Project
- Generation of possible applications and uses within the home bathroom
- Discussion of privacy concerns related to having some of the technology tracking you in the bathroom.







Post workshop discussion about possible applications of technology in the bathroom - Workshop 3



STEP 5 - Co-Design workshop 4:

Livability Lab setup

Workshop 4 was based around the *Livability Lab* setup. The Co-Designers were asked to provide their advice and feedback on the research methods to help guide us in setting up the *Livability Lab* that would appeal to future Lab volunteers.

Preparation for workshop 4

Before coming to the last Co-Design workshop for 2013, Co-Designers were mailed the draft Livability Lab *Project Information Statement*. They were given the Project Information Statement and a 1-page questionnaire about it to fill out before the workshop.

In this the Co-Designers were asked to give feedback on:

- How clear the **purpose of the study** was
- How **informative** the description of the study was
- The **amount of detail** the description of the study provided
- Whether the information sheet would **motivate people to take part** in the study
- Any **confusing or difficult to understand** information
- Any other comments

Workshop 4: Livability Lab setup

November 8, 2013

Squarehouse, UNSW

Researchers:		Co-Designers:	
Oya Demirbilek	Peter Sweatman	Anna	Tony
Steve Ward	Steve Davey	Penny	Joy
Russell Lowe	Alicia Mintzes		Joan

Project Information Statement

The first component of the Workshop was to go over the Project Information Statement (PIS) and short questionnaire in two sub-groups. This was very beneficial in evaluating the PIS and providing valuable feedback on:

- Clarity of purpose
- Quality of information given for the study (description)
- Other comments and concerns
- Thoughts on additional information would motivate people to participate (type of voucher, etc.)

Comments were recorded and small changes were subsequently made to the PIS to increase understanding.

Feedback on Lab Set-up

Following a short break, Co-Designers were run through the sequence of a Lab session and the types of testing to be carried out.

1. Testing demonstrations (with demonstration by Russell Lowe) and testing feedback
2. Additional Lab testing feedback (if not covered):
 - Length of session and fatigue issues
 - Any other considerations/comments (such as breaks, privacy, comfort etc.)

1. Anthropometric Measurements

Steve Ward demonstrated taking anthropometric measurements (see Figure 16), and which measurements would be taken. The concerns the research team had around this type of testing were related to the time it would take, the types of clothing (exercise type clothing) that should be worn, and whether this was acceptable to older people, what facilities should be provided for people to comfortably change into these clothes and concerns around the time it would take for people to be measured.



Figure 16. Explaining anthropometric equipment and measurements

The demonstration was followed by a discussion, where the Co-Designers provided useful feedback on the testing. The Co-Designers refuted many of the concerns the researchers had around how older people felt about clothing and testing, which was interesting. The main outcomes were:

- Bicycle shorts were suggested as a preferred type of clothing that would allow for free movement and comfort while allowing measurements to easily be taken. To be either provided or participants to bring their own.
- Importance of a chair in the changing room, somewhere to hang or put clothing and other items. Having a same sex lab staff on hand to help.
- Standing time:
 - Test first on younger participants to fine-tune skills before testing older people
 - Allow older participants to hold onto something
 - Acceptable testing time 5-10 min

2. Motion Capture Clothing

The motion capture testing was discussed, particularly to gauge how the Co-Design team felt about:

- Using provided Velcro vest and pants
- Process of attaching markers
- Use of Lycra belt to simulate clothing management

Russell Lowe demonstrated wearing the Motion Capture suit and Peter Sweatman ran through applying the markers and how the testing would be carried out (see Figure 17).

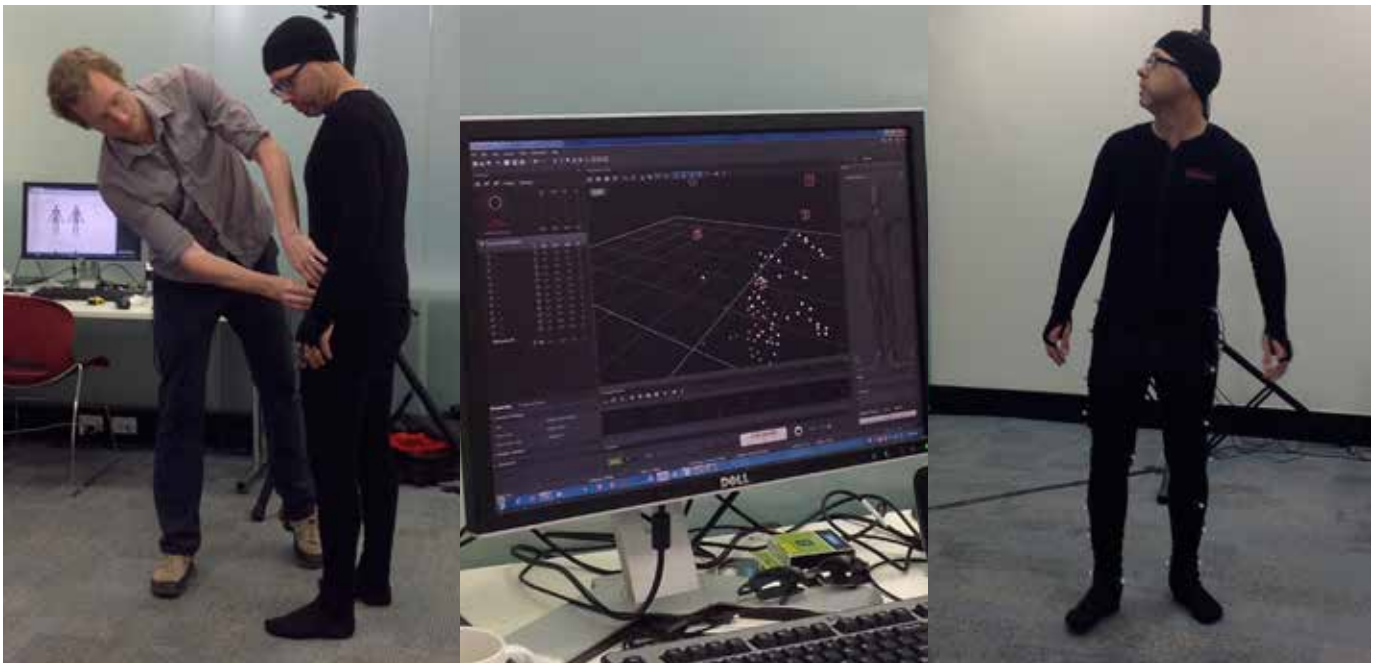


Figure 17. Motion Capture: applying markers, on screen appearance and simulating clothing management

The demonstration was very successful and interesting feedback and comments were gained. The main discussions centred around clothing for capturing data and simulation of clothing (Table 20).

The workshop was very engaging and successful. The Co-Designers offered thoughtful insight on the entire Lab process, from recruiting participants to thanking them at the end. Getting Co-Designer feedback helped to adjust the Lab Protocol and session structure to maximise participation and reduce participant fatigue. Refer to see for more detail on the workshop findings.

Table 20: Discussion topics and suggestions

Discussion Topic	Suggestions
Clothing for motion capture	• Possible types of clothing to allow for Velcro markers including surgical hose or tape on bicycle shorts • Warning against sticking markers on skin as older people's skin is more fragile
Simulating clothing	• No problem with the idea of it or doing it
Simulating use	• Possibly optional • Wait until the end of the session when people are more comfortable • Applies to clothing management as well – wait until people are more comfortable – do not do this right at the beginning • Explain the importance of it.

Workshop 4: Outcomes

The workshop provided the research team with valuable information on the set up and recruitment of participants to the Livability Lab.

The outcomes of the session were:

- Increased knowledge about acceptable clothing for testing
- Better understanding of acceptable time for various tests
- Strategies for dealing with privacy concerns
- Acceptance of the testing methods (anthropometrics and motion capture)



Demonstrating motion capture suit - Workshop 4



STEP 6 - Co-Design workshop 5:

Subtask Scenarios and storyboarding

The purpose of this workshop was to explore potential ways of integrating new materials and technologies into everyday bathroom products that will enable people to carry out bathroom routines in an easier, safer and more enjoyable way.

Workshop 5: Subtask Scenarios and storyboarding

February 8, 2014

Squarehouse, UNSW

Researchers:	Co-Designers:	
Oya Demirbilek	Anna	Tony
Steve Davey	Penny	Joy
Alicia Mintzes		Joan

Subtasks

The Co-Designers were divided into two subgroups and given different scenarios:

- **Scenario 1: Going out for lunch.**

This involves going to the toilet and ‘freshening up’ before leaving the house. What do you do?

- **Scenario 2: Coming home after a hot/sweaty day.**

This involves the need to take a shower and relax. What do you do?

In order to better understand where possible changes could be made to make the scenario better, or easier to carry out, the Co-Designers were asked to break down their scenario into sub-tasks.

Each Co-Designer broke down their routines into each step they would take to perform the activities. These sequences were numbered and recorded (Figure 18). They were then used to aid the storyboard exercise.

- Going out for LUNCH
- (RIT)
- OPEN
- ① INTO BATHROOM
 - ② TURN ON LIGHT
 - ③ GO TO BASIN
 - ④ OPENDRAWER (LIPSTICK + POWDER)
 - ⑤ PUT ON BENCH
 - ⑥ OPEN CABINET
 - ⑦ PRESS + MIX MAKEUP
 - ⑧ TURN ON TAP
 - ⑨ RINSE HANDS
 - ⑩ PUT ON POWDER + LIPSTICK
 - ⑪ PUT items back
 - SLIDING CABINET
 - DRAWER
 - ⑫ STEP TO TOILET
 - ⑬ LIFT SEAT
 - ⑭ TOILET
 - ⑮ REACH FOR TP + USE
 - ⑯ STAND UP
 - ⑰ SEAT/LID DOWN
 - ⑱ FLUSH
 - ⑲ WALK TO BASIN
 - ⑳ TURN ON TAPS
 - ㉑ PRESS HANDWASH PLUNGER
 - ㉒ WASH HANDS
 - ㉓ TURN TAPS OFF
 - ㉔ LEAN OVER FOR HAND TOWEL
 - ㉕ WIPE HANDS
 - ㉖ REPLACE HAND TOWEL
 - ㉗ WALK TO DOOR
 - ㉘ TURN OFF LIGHT
 - ㉙ EXIT + CLOSE DOOR
- (DON)
- ① DOOR ALREADY OPEN
 - ② WALK IN
 - ③ TURN ON LIGHT
 - ④ ~~GET~~ OPEN DRAWER
 - ⑤ GET OUT COMB MIRROR, TOOTH-BRUSH + PASTE + DEODORANT
 - ⑥ PUT ON BENCH TOP
 - ⑦ COMB HAIR WHILE HOLDING MIRROR
 - ⑧ Apply deodorant
 - ⑨ CLEAN TEETH:
 - ⑩ TURN ON TAP
 - ⑪ PUT TOOTHBRUSH UNDER WATER
 - ⑫ TURN OFF WATER
 - ⑬ FILL GLASS W/ WATER
 - ⑭ BRUSH + RINSE TEETH
 - ⑮ WASH GLASS
 - ⑯ PUT EVERYTHING BACK IN TOP DRAWER
 - ⑰ RINSE HANDBASIN
 - ⑱ EXIT BATHROOM
 - ~~TURN OFF LIGHT~~
 - ⑲ ENTER TOILET
 - ~~LIFT LID~~
 - ㉑ GO
 - ㉒ GO BACK TO BATHROOM
 - ㉓ TURN TAPS ON
 - ㉔ WASH (SOAP ON BASIN)
 - ㉕ Take Towel off RAIL
 - ㉖ DRY HANDS
 - ㉗ Replace
 - ㉘ TURN LIGHTS OFF
 - ㉙ EXIT

Figure 18. Scenario 1: Going out for Lunch sequence with sub-tasks from both Co-Designers

Storyboard

Each group was then asked to develop a storyboard based on their scenario where they re-designed aspects of the bathroom or process in order to make the activities easier or more enjoyable. The research team assisted the Co-Designers with pre-prepared image sets and sketching on the spot to develop 3-5 boards (see Figure 19 and 20).

These storyboards were then presented to the other group and the various new components or features discussed. Interestingly, both groups had a high use of sensors to control things, such as turn on lights or change heights of fixtures. Self-cleaning was also very popular.

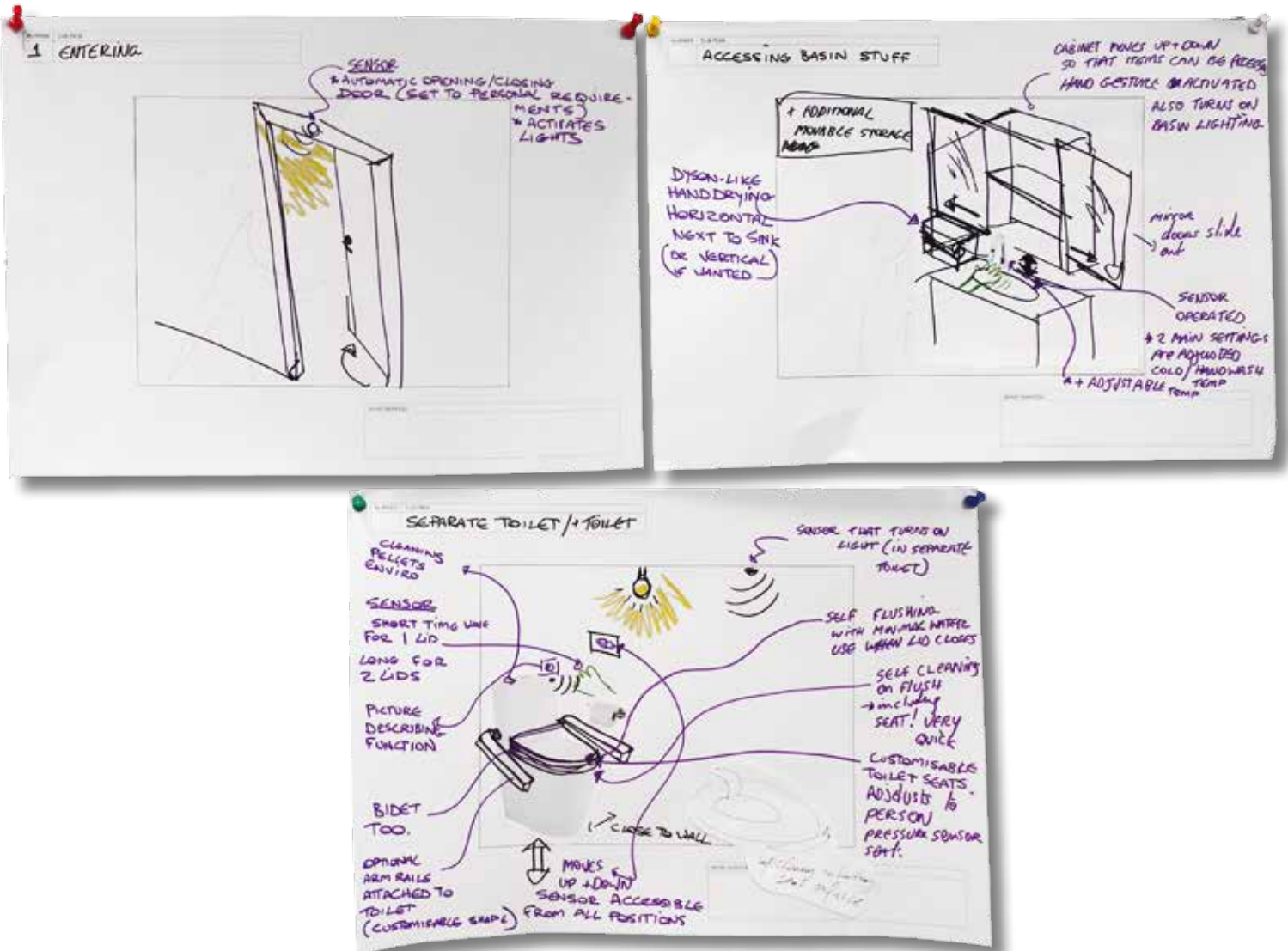


Figure 19. Storyboard sequence for Scenario 1: Going out for lunch.

Following the workshop, the research team had a graphic designer polished these boards and resent them to the Co-Designers for further comments and amendments. These boards and a summary of the workshop sessions' results were the basis for the following session, involving GWA designers with the Co-Designers.

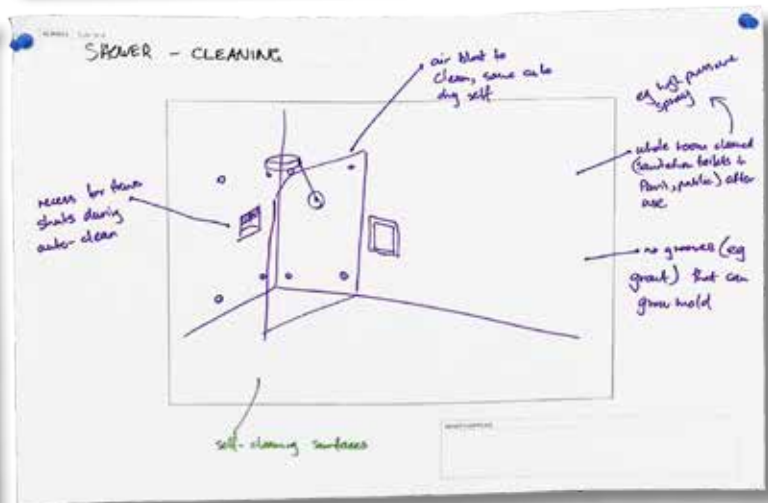
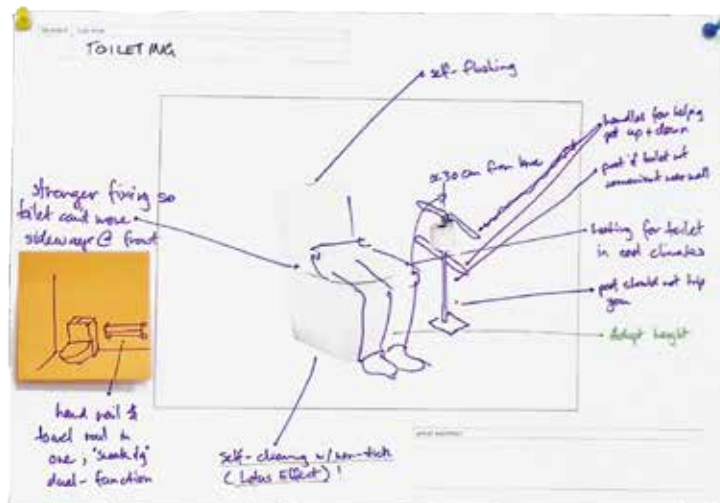
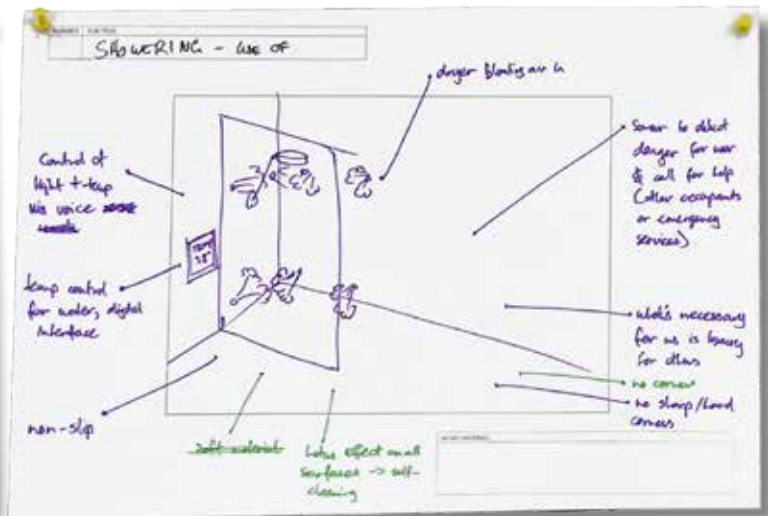
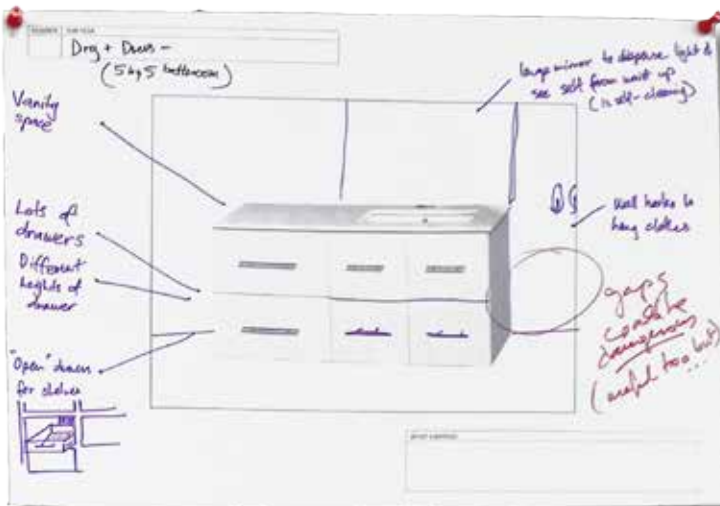


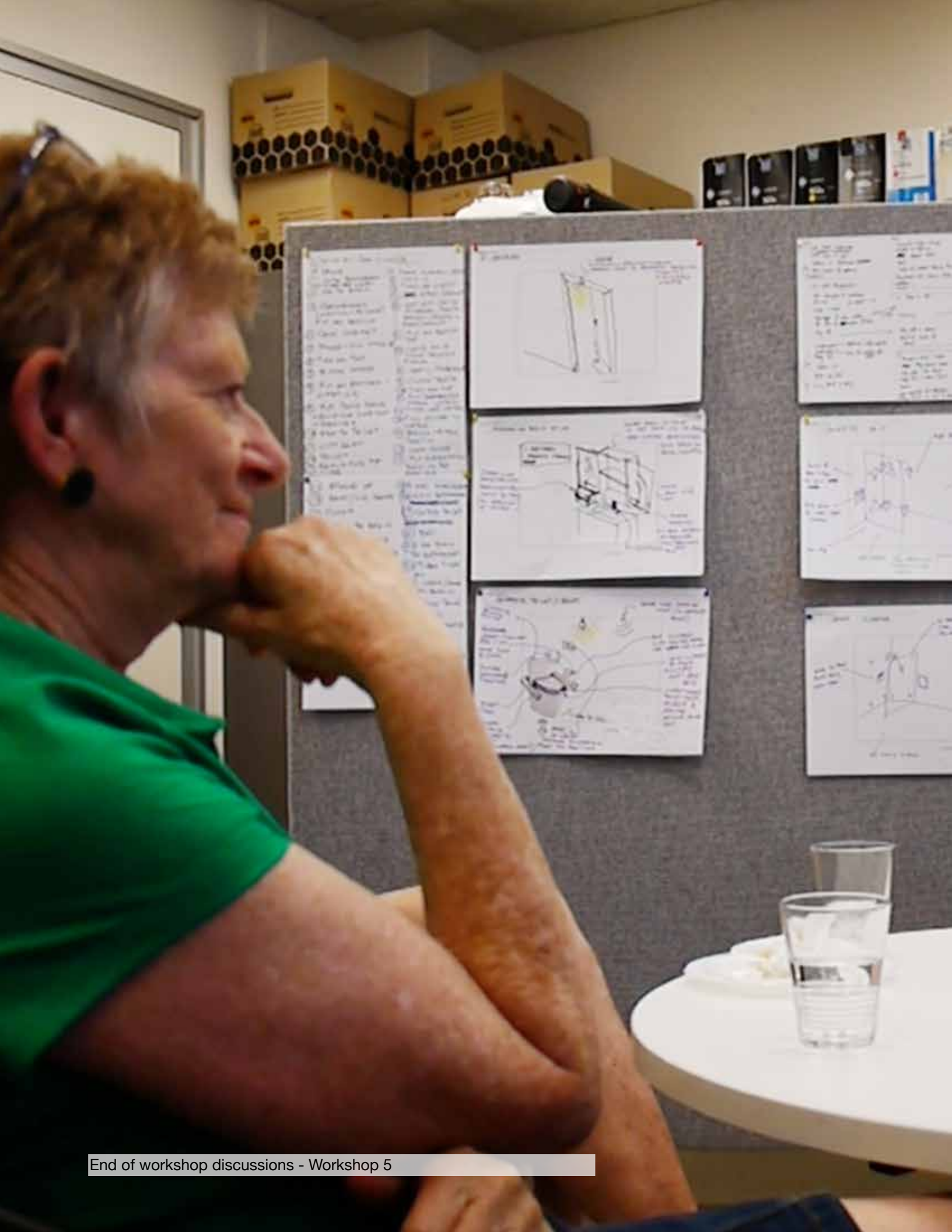
Figure 20. Storyboard sequence for Scenario 2: Coming home after a hot/sweaty day

Workshop 5: Outcomes

The workshop provided the Co-Designers with the tools to re-create their bathroom activity by 'designing' the bathroom space with new technology and fixtures to suit their needs.

The outcomes of the session were:

- Better understanding of how tasks are performed differently depending on the person
- Quick uptake of new technologies and materials in the storyboard exercise
- Re-affirmation of previously voiced concerns and opinions of the bathroom, as evident in solutions to overcome them



End of workshop discussions - Workshop 5

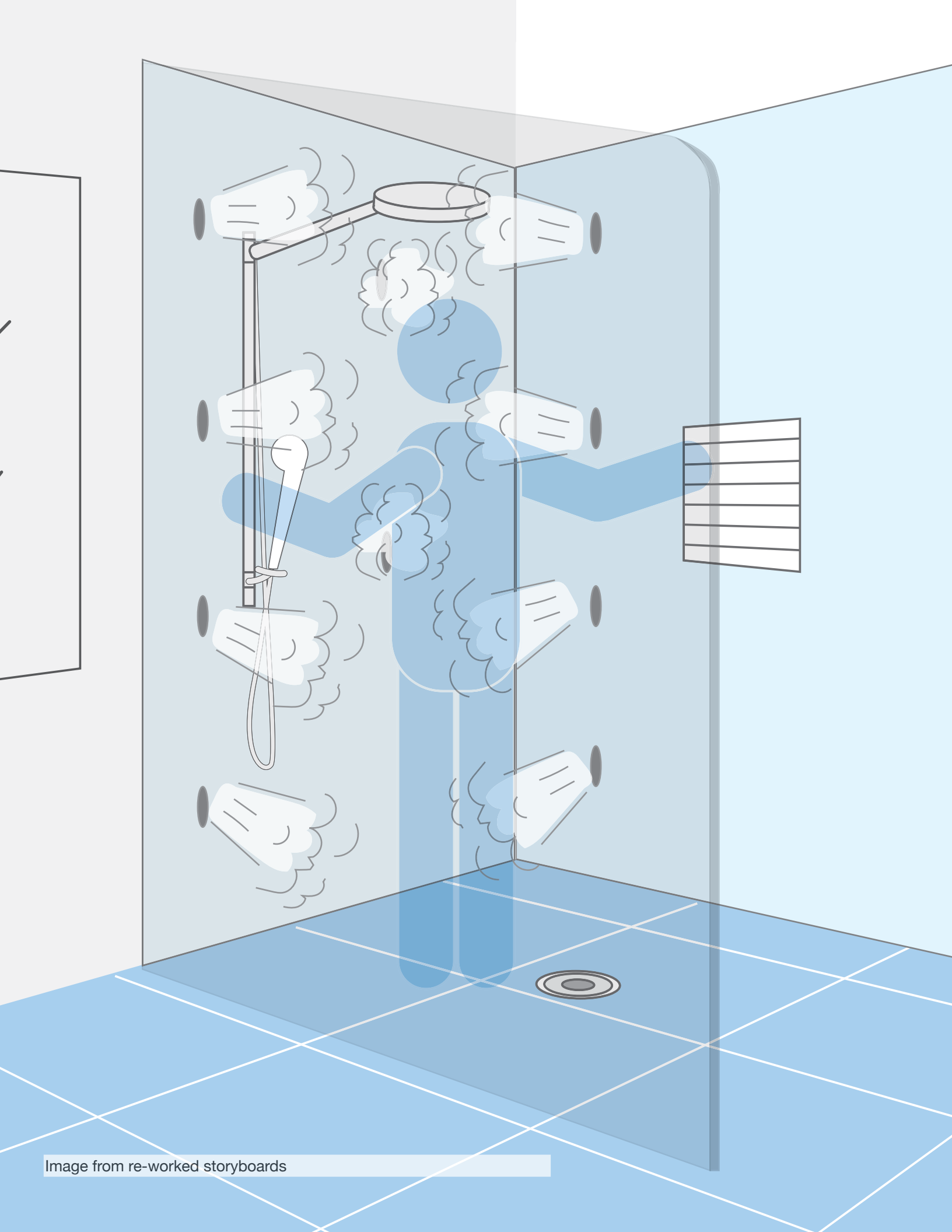


Image from re-worked storyboards

STEP 7 -Presentation to Designers:

Presentation of Co-Design session outputs to GWA Bathrooms and Kitchens Design Team

The purpose of this presentation was to involve GWA Bathrooms and Kitchens's design team with the Co-Designers. Workshop 6 was planned for co-creation between GWA Bathrooms and Kitchens designers and the Co-Designers. The plan was to have GWA Bathrooms and Kitchens designers present bathroom concepts based on the Co-Designer input from the previous sessions.

In order to achieve this, two members of the research team presented the research findings from the previous six Co-Design steps and the Co-Designer storyboards to members of the GWA Bathrooms and Kitchens's design team. This presentation allowed the GWA Bathrooms and Kitchens design team to ask questions and better understand older people's needs and concerns as outlined by the Co-Designers.

Preparation for Presentation

Before coming to the presentation, the Co-Design outcomes (Figures 18-20) from Workshop 5 were tidied up with the help of a graphic designer in order to make them easier to understand as well as capture all the scenario steps discussed in the presentation. The Co-Designers were sent a copy of these to review.

The outcomes of Workshop 5 that were re-created were:

- Breakdown of routines for Scenario 1: Going out to Lunch
- Re-designed storyboards for Scenario 1 (5 storyboards).
- Breakdown of routines for Scenario 2: Coming home hot and sticky
- Re-designed storyboards for Scenario 2 (5 storyboards).

Scenario 1: Going out to lunch

SCENARIO

1

Tony: Going out for lunch



1. Door already open
2. Walk into bathroom
3. Turn on light
4. Open drawer
5. Get out comb mirror, tooth brush, paste, deodorant
6. Put on bench top
7. Comb hair while holding mirror
8. Apply deodorant
9. Turn on tap
10. Put toothbrush under water
11. Turn off water
12. Fill glass with water
13. Brush and rinse teeth
14. Wash glass
15. Put everything back in top drawer
16. Rinse handbasin
17. Exit bathroom
18. Enter toilet
19. Use toilet
20. Go back to bathroom
21. Turn taps on
22. Wash (soap on bench top)
23. Take towel off rail
24. Dry hands
25. Replace towel
26. Turn lights off
27. Exit

Going out for lunch

10

SCENARIO

1

Penny: Going out for lunch



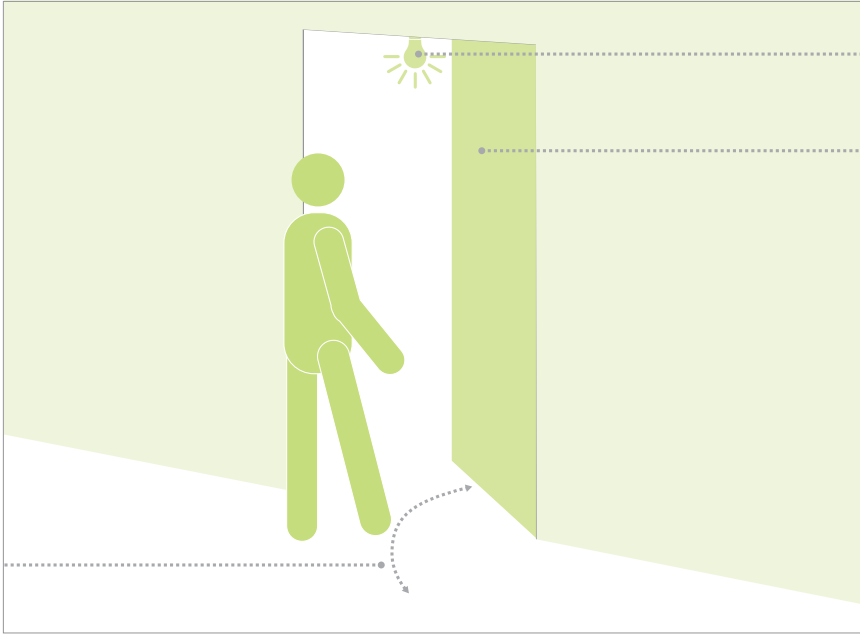
1. Open bathroom door
2. Turn on light
3. Go to basin
4. Open drawer (lipstick + powder)
5. Put on bench
6. Open sliding cabinet
7. Press + mix makeup
8. Put on bench
9. Turn on tap
10. Rinse hands
11. Put on powder and lipstick
12. Put items back (sliding cabinet, drawer)
13. Step to toilet
14. Lift seat
15. Use toilet
16. Reach for toilet paper and use
17. Stand up
18. Toilet lid down
19. Flush
20. Walk to basin
21. Turn on taps
22. Press handwash plunger (on basin top)
23. Wash hands
24. Turn taps off
25. Lean over for hand towel
26. Wipe hands
27. Replace hand towel
28. Walk to door
29. Turn off light
30. Exit + close door

Going out for lunch

11

Scenario 1: Going out for lunch.

STEP 1 Entering bathroom



Light turns on automatically when door opens

Automatic opening/closing sensor operated door

Door opens either way (set to personal requirements)

Going out for lunch 12

STEP 2 Accessing basin products



Additional storage moves up/down for easy access

Mirror doors automated open/close (sensor operated)

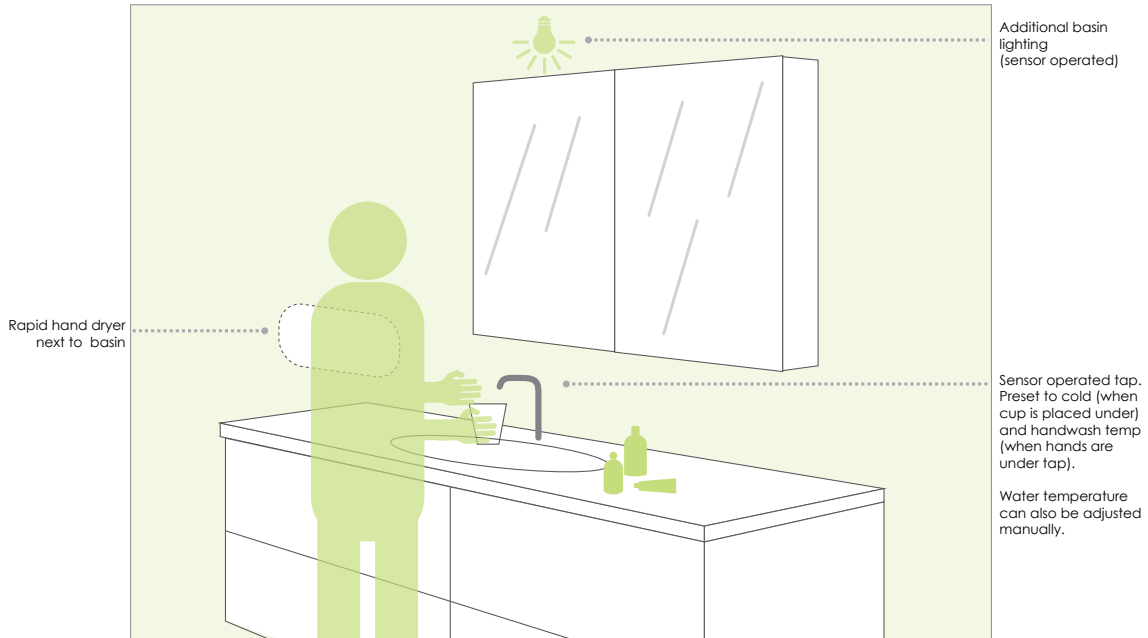
Cabinet moves up/down for easy access to shelves (sensor operated)

Adequate space to place items on benchtop

Going out for lunch 13

STEP
3

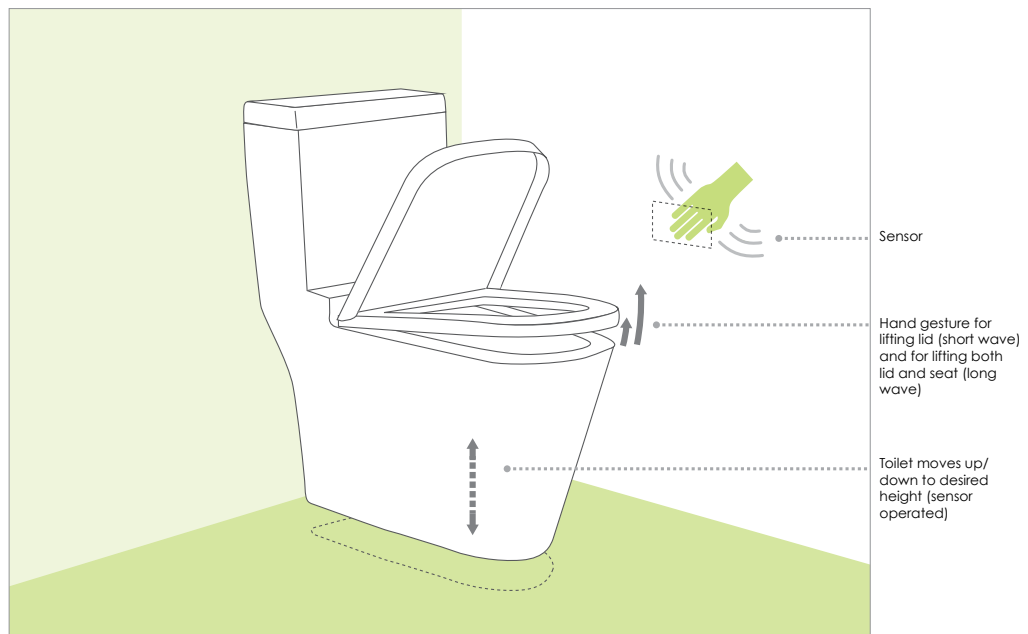
Grooming



Going out for lunch 14

STEP
4

Getting toilet ready for use

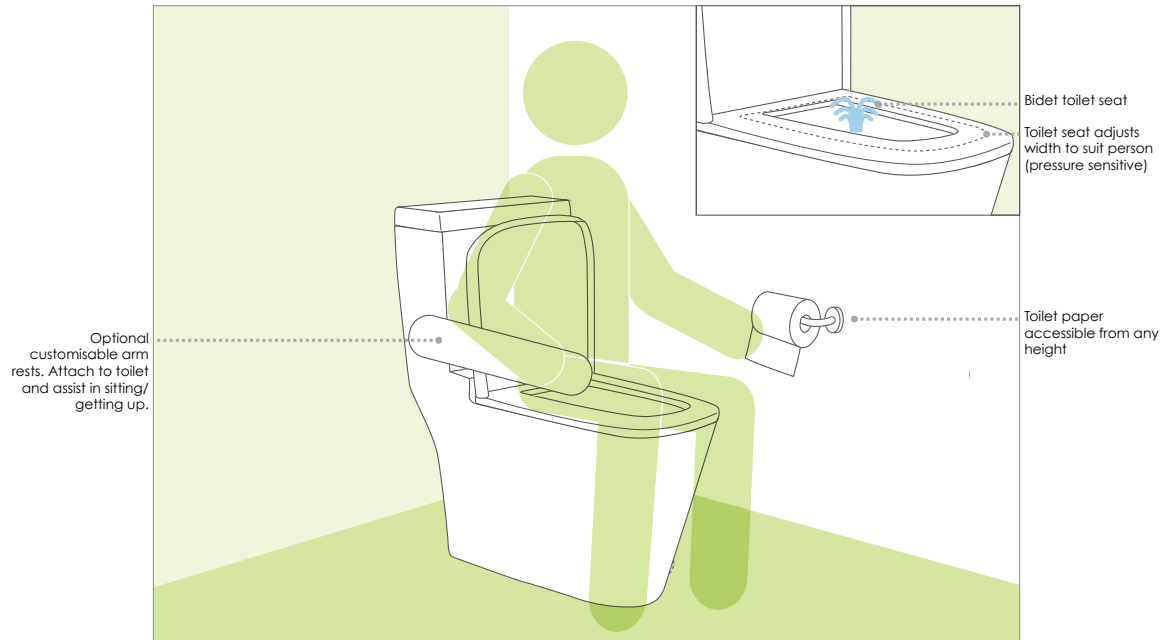


Going out for lunch 15

STEP

5

Toileting



Going out for lunch

16

Scenario 2: Coming home after a hot/sweaty day.

SCENARIO

2

Anna: Coming home hot and sticky



1. Bring fresh underwear into bathroom
2. Put fresh clothes on door hook or folded on vanity surface
3. Remove underwear standing in bathroom
4. Use toilet
5. Open hinged shower door
6. Set water temperature
7. Hair: shampoo and conditioner and rinse
8. Soap + wash
9. Remove squeegee hung in corner of shower
10. Squeegee and clean water off tiles, glass and floor.
11. Replace squeegee
12. Dry off
13. Apply antiperspirant + deodorant + talcum powder
14. Put underwear on, leaning on a wall for balance
15. Clean talcum powder off floor
16. Dry hair
17. Hang towel to dry on towel rail
18. Touch up hair

Coming back hot and sticky 18

SCENARIO

2

Joan: Coming home hot and sticky



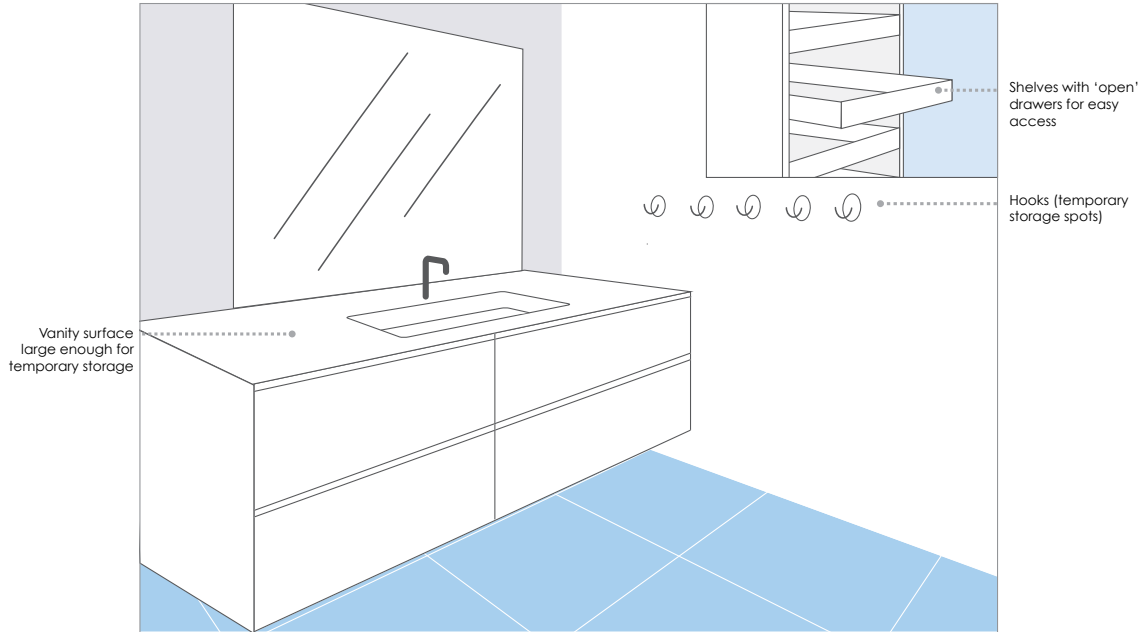
1. Collect complete clothes change
2. Straight to bathroom
3. Deposit clothes
4. Toilet
5. Check all needed cleaning items are there
6. Hang towel over shower screen
7. Undress
8. Shower on
9. Shampoo + conditioner + wash
10. Dry shower recess with chamois (in plastic container on soap rack)
11. Dry self with towel, still in shower
12. Use same towel to dry off shower screen
13. Wrap hair in same towel
14. Use chamois to dry off shower (to prevent mold)
15. Dress
16. Go outside to dry hair
17. Hang towel on line (outside) to dry

Coming back hot and sticky 19

STEP

1

Entering bathroom and taking off clothes



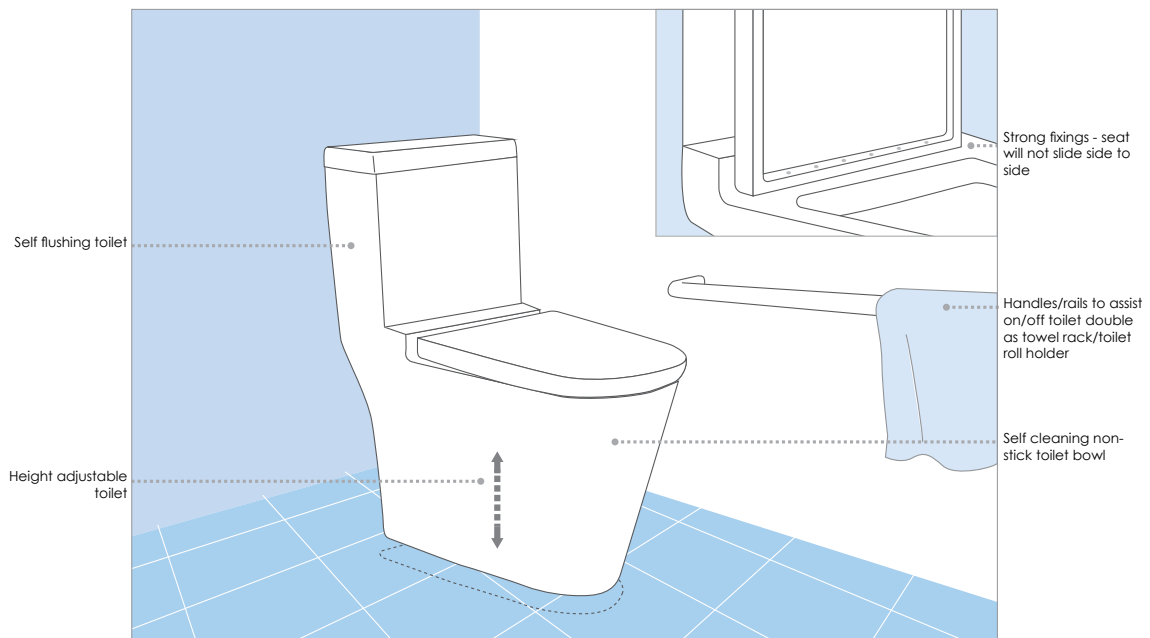
Coming back hot and sticky

20

STEP

2

Go to toilet



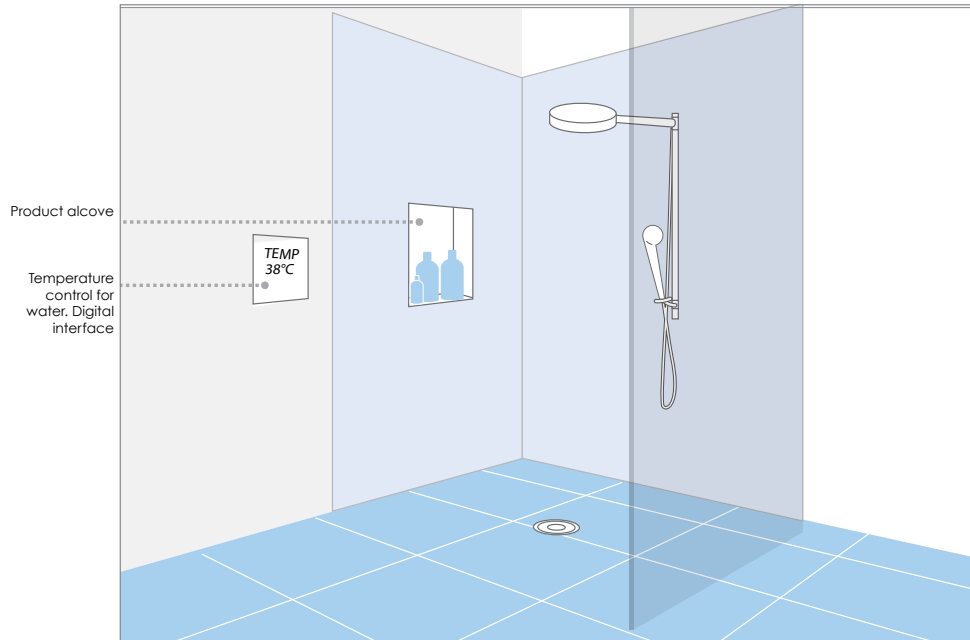
Coming back hot and sticky

21

STEP

3

Preparation for showering



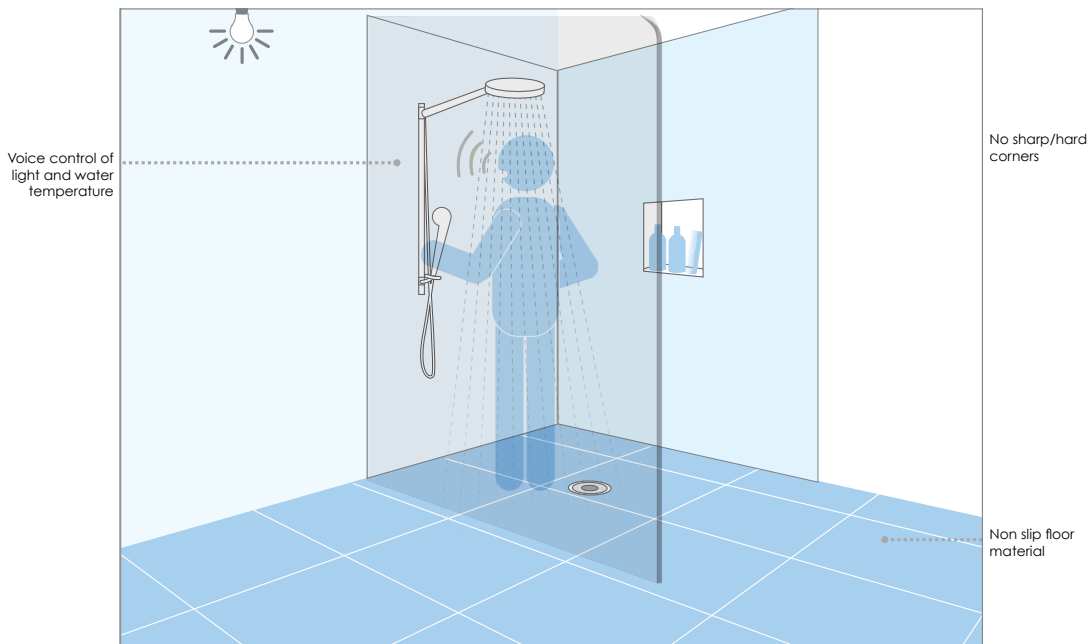
Coming back hot and sticky

22

STEP

4

Showering



Coming back hot and sticky

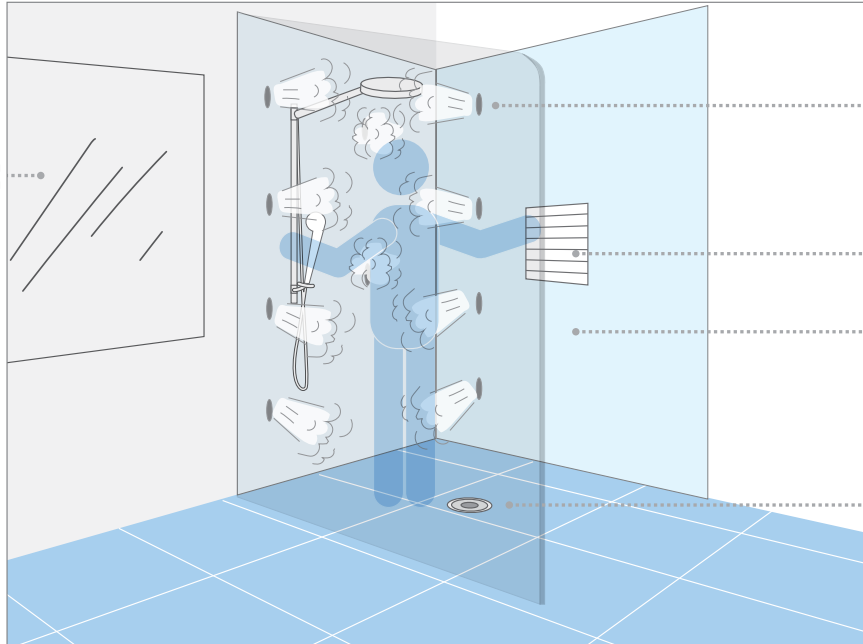
23

STEP

5

Drying

Mirror self cleaning
and defogging



Air dryer in shower.
Dries person and
shower at the same
time

Product alcove
closes for drying

Whole room self
cleans.
No surface grooves
(e.g. grout) that can
grow mold

Water drained and
all surfaces dry

Coming back hot and sticky

24

Presentation to GWA B & K design team

May 2, 2014

GWA Bathrooms and Kitchens, Bella Vista

Researchers:	GWA Bathrooms and Kitchens designers:	
Alicia Mintzes	David Giorgio	Luke DiMichiel
Peter Sweatman	Leonie Brickwood	Vincent Ho

Alicia and Peter presented the preliminary results of the Co-Design sessions and workshops until Step 6 (Figure 4) accompanied with presentation boards. GWA Bathrooms and Kitchens designers were then invited to take part in the following Co-Design workshop and present preliminary bathroom concepts guided by the presentation of the Co-Design findings so far.



Figure 21. Presentation to GWA Bathrooms and Kitchens design team

The presentation consisted of:

- An overview of Co-Design and introduction to Co-Design group
- An overview of the preceding Co-Design workshops and what they were about
- Unexpected findings from the Co-Design sessions
- The top 3 concerns for the future
- Guiding design principles based on the research findings
- Invitation to participate in the next Co-Design workshop
- Overview of Workshop 5: Scenario sub-tasks and storyboard exercise
- Issues and Ideas findings based around specific bathroom fixtures and environments

The presentation was very well received and the response from GWA Bathrooms and Kitchens designers was constructive and positive. The designers were interested in the findings and had many questions regarding specifics. In particular, there was a lot of discussion surrounding the Co-Designer's opinions about the bathtub and their dismissal of it later on in life (Workshop 2). Moreover, the GWA Bathrooms and Kitchens designers asked about how the Co-Designers felt about other fixtures and features that had never been discussed in the workshops, such as the use of heated seats.

Presentation Outcomes

The presentation provided the GWA Bathrooms and Kitchens design team with the Co-Design workshop findings and design direction. It prepared them for the workshop 6 and meeting the Co-Designers.

Parts of the presentation that were the most interesting to the GWA Bathrooms and Kitchens design team were:

- Co-Designers' acceptance of new technologies and materials
- Openness of Co-Designers in discussing private and intimate activities



Bathroom concept presentation - Workshop 6

STEP 8 - Co-Design workshop 6:

GWA Bathrooms and Kitchens design team collaboration

Workshop 6 followed on from workshop 5, where everyday bathroom routines were explored and re-imagined through the use of storyboards. During this session, GWA Bathrooms and Kitchens designers presented bathroom concepts based on the Co-Designer workshops and Workshop 5 Subtask and Scenarios. Following the presentations, the designers got feedback from the Co-Designers and worked with them on their bathroom design concepts.

Workshop 6: GWA Bathrooms and Kitchens design team collaboration

May 9, 2014

Squarehouse, UNSW

Researchers:	Co-Designers:	GWA Bathrooms and Kitchens designers
Oya Demirbilek	Penny	Anna
Steve Davey	Tony	Joan
Alicia Mintzes		Joy
Peter Sweatman		

GWA Bathrooms and Kitchens concept presentation



Figure 22. Presenting a bathroom concept

GWA Bathrooms and Kitchen designers each presented a bathroom design concept to the Co-Designers and research team. Each presented an entire bathroom environment with new configurations and concept fixtures based on the Co-Design session findings.

Both bathroom concepts focused on integrating sensors and technology into the bathroom as well as providing transitions between spaces and attractive grab-able fixtures throughout the room.

Some of the key design features were:

- Integrated storage solutions
- Fixtures doubling as grab rails
- Easy to clean or self cleaning surfaces
- Electronic and sensor controls
- Non-slip flooring and good drainage solutions
- Aesthetic design considerations throughout the bathroom

Co-Designer feedback on bathroom concepts

After the presentations, the designers sat with the Co-Designers in two different groups and went through their concept, gathering additional comments and feedback on their concepts.



Figure 23. Getting feedback on concepts

This was yet another opportunity for the GWA Bathrooms and Kitchens Design team to have direct input from the Co-Designers and gather additional comments and feedback from the Co-Designers on their concepts. The feedback and suggestions were added to printouts of the presentation. The findings from the feedback session were:

- The importance of **grab rails** and the need for them to be aesthetically pleasing
- **Acceptance of technology**, with manual override just in case
- **Flexibility** of use
- Ease of **cleaning** very important
- **Consideration of others** - guests and other family members
- Concerns for **resale**

The Co-Designers were very engaged and pleased with the concepts and outcomes of the workshop. The designers were very attentive and thorough in addressing the Co-Designer concerns in their concepts. Moreover, it provided an opportunity for them to get a better understanding of the process of design.



Figure 24. Making changes to concepts based on feedback

Designer feedback on the Co-Design Collaboration

After the workshop, the GWA Bathrooms and Kitchens designers were sent questions to answer about their experience working with the Co-Designers. These questions began with an assessment of the presentation of the Co-Design research findings to date and Co-Designer storyboards before their concept development. Following this, they were asked questions about their presentations and involvement with the Co-Designers during the workshop, and lastly, what they could take away from this experience that would help future work at GWA.

The main take-away message from GWA Bathrooms and Kitchens designers was the importance of engaging with user groups in order to better understand their needs and requirements. Moreover, engaging with the Co-Design group helped to challenge assumptions about older people, particularly in terms of their acceptance of technology.

Workshop 6: Outcomes

The workshop provided a valuable and fluid collaboration between GWA Bathrooms and Kitchens designers and the Co-Designers.

The outcomes of the session were:

- Better understanding of the needs and requirements of older people
- Challenging traditional assumptions of the target market



Discussing Leonie's bathroom concept- Workshop 6



Workshop briefing- Workshop 7

STEP 9 - Co-Design workshop 7:

Participant Feedback on Virtual Reality Experience

Workshop 7 followed on from Workshop 6 where GWA Bathrooms and Kitchens designers presented design concepts for bathroom fittings based on the Co-Designer contribution and information of what works and what doesn't work in the bathroom.

During this session, Co-Designers used Oculus Rift headsets and Kinect motion sensors to interact with a number of prototype virtual reality environments. They provided thoughts and feedback on the experience of a technology that was new to them. This provided insights into how older people responded to immersive technology. It provided useful information to further develop the environments and interaction methods for future use in lab investigations.

Workshop 7: Participant Feedback on Virtual Reality Experience

August 8, 2014

Squarehouse, UNSW

Researchers:	Co-Designers:	
Oya Demirbilek	Anna	Tony
Steve Davey	Penny	Joy
Peter Sweatman		Joan

Immersive Virtual Prototyping:

The Co-Designers were introduced to these new technologies with short demonstrations, and then invited to try them out and give their thoughts and feedback on how the experience felt first-hand, and how they would describe the technology to a non-technical friend.

The Co-Designers were divided into two sub-groups. In each group, each participant wore the Oculus Rift, talking through their subjective personal experience while attempting the following:

- Sitting and looking around, no Kinect tracking to move their virtual avatar
- Sitting and looking around, performing simple gestures with the Kinect
- Standing and looking around, no Kinect tracking to move their virtual avatar
- Standing and looking around, performing simple gestures with the Kinect
- Interacting with a simple interactive game in the environment

To reduce risk of motion sickness, group members alternated taking turns wearing the Oculus Rift for 2 min intervals. Participants could choose to stop at any time.

The Co-Designers responded intuitively to the virtual reality experience using the Oculus Rift headset. They quickly learnt how to interact using simple gestures to perform the tasks. They responded to the environment and understood it enough to critique its shortcomings.

Group discussion about Immersive Virtual Prototyping:

Each group discussed their experiences, including:

- Sense of reality of the environment
- Comfort / discomfort
- How would they explain the Oculus Rift and Kinect technology to a non-technical friend

One of the outcomes of the session was their relationship to space. Some Co-Designers commented that their sense of scale and positioning of their avatar in the virtual environment did not seem accurate. They could see their hands moving around but they were frustrated with where they were. There were also issues around judging distance. The sense of scale in the virtual environment did not seem accurate. This is possibly related to the focal length of the virtual camera. In using this technology in the evaluation of a designed space, as a substitute to real world experience, it is critical that the sense of space and judging scale needs to be correctly calibrated. This suggests a set of testing where users are asked to estimate dimensions

Workshop 7: Outcomes

The workshop was successful in introducing the Co-Designers to an interactive virtual reality experience using Kinect and Occulus Rift technologies.

The outcomes of the session were:

- All Co-Designers adapted readily to the virtual environment and interacted intuitively with it.
- They were able to easily respond to and evaluate the accuracy of the environment.
- The scale of the environment and the avatar's positioning within it did not feel realistic.
- Realistic representation of the environment and person in the virtual reality experience is key to the usefulness to the technology for further testing.



Manipulating a virtual object using Oculus Rift and Kinect- Workshop 7





Pilot testing the Livability Lab

STEP 10 - Co-Design Livability Lab pilot tests

During January and February 2015, four of the Co-Designers were test subjects for pilot testing of the Livability Lab protocol. The protocol for the long session had been developed through a number of iterations following Co-Design Workshop 5 and had been thoroughly refined through evaluation with other members of the project team. As well as confirming the technical performance of the multiple capture systems the use of Co-Designers provided valuable insights into the test subjects personal experience of the testing.

Livability Lab Test Sessions

Dates 30/1/15, 5/2/15, 12/2/15, 26/2/15

Squarehouse, UNSW

Researchers:	Co-Designers:	
Peter Sweatman	Tony	Joan
Kate Tong	Joy	Penny
Steve Ward		

Each session was run as a rehearsal for actual test subjects and included all steps in the protocol. One of the key concerns to be addressed in the this pilot testing was working out the likely duration of the session and how it should be paced to avoid fatigue and ensure participant comfort and enjoyment. The session involves many unusual and potentially embarrassing questions, activities and clothing changes. The primary researchers were unsure how older people would respond when they were confronted with these parts of the session. throughout the pilot sessions, Co-Designers provided feedback on how people like them might respond to situations and offered tips to ensure researchers treated these aspects with appropriate sensitivity.

The pilot testing involved all the stages documented in the protocol document:

- Reception: sign consent and OHS documents
- Interview about preferences
- Fitting trial
- Exploring a range of heights to determine preferences
- User evaluation of Caroma designs
- Anthropometric measurements
- Motion capture suit fitting with markers
- Motion trials
- Motion capture of reaching tasks
- 3D scan of one hand.

The Co-Designers provided brief tips and insights throughout the session concerning how things could be made clearer or more comfortable for subjects. A debrief was conducted at the end of the session which explored a range of questions and concerns more thoroughly.

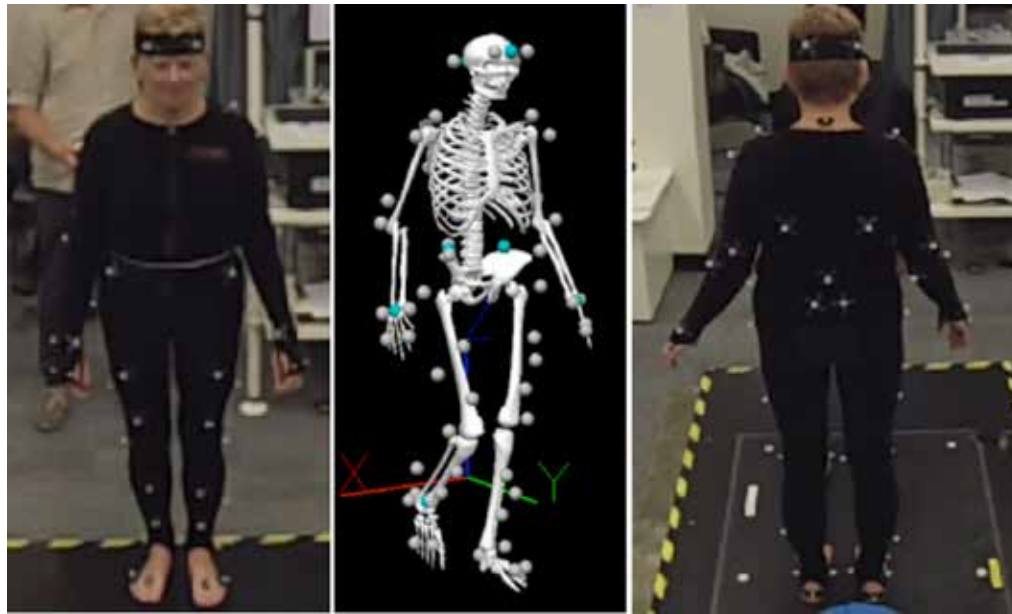


Figure 25. Motion Capture suit and corresponding computer image.

Testing outcomes

The four sessions went relatively smoothly and confirmed the benefits of many of the changes to the testing sequencing and instruction wording developed through testing with research team members. It provided a worthwhile practice run for the researchers to manage a complex and lengthy testing session involving many stages and multiple pieces of equipment. A number of technical refinements were made to improve the accuracy of the capture methods. The full speed run through also confirmed that the session duration could be kept to a manageable 2.5-3.5 hours, dependent on the pace at which the participant wished to proceed.

In addition to confirming the session design the Co-Designers each provided multiple tips such as improving the wording of questions, suggesting when breaks would be appropriate, and advising on provision of supports while getting into the motion capture suit. An additional reaching task capture, investigating a support to assist lowering to the seat, was added to the protocol after being suggested by a Co-Designer.

Pilot Testing Outcomes

Co-Designers were the first test subjects to go through the complete lab session

Key findings/outcomes of their input:

- The proposed protocol was confirmed as acceptable
- A number of minor modifications were made to the protocol to improve the clarity of instruction and ensure maximum participant comfort and candidness including:
 - Timing of breaks
 - Support with fitting of motion capture suit
 - Additional tasks to be captured



Pilot testing the Livability Lab



Workshop overview - Workshop 8

STEP 11 – Workshop 8:

Review of Co-Design Workshops and Lab Testing Results

This workshop was the final Co-Design workshop for Livable Bathrooms Project. It was therefore a review and wrap up of all the Co-Design workshops as well as an update on our research.

Workshop 8: Review of Co-Design Workshops and Lab Testing Results

May 21, 2015

Squarehouse, UNSW

Researchers:		Co-Designers:	
Oya Demirbilek	Peter Sweatman	Tony	Anna
Alicia Mintzes	Kate Tong	Joy	Penny

Review of the Co-Design process

Oya Demirbilek began the workshop with a presentation wrapping up all the Co-Design activities since late 2012. At every activity, the Co-Designers were asked to remember the most important outcomes they remembered. This was interesting as it allowed for more contribution and also an understanding of some of the key aspects of each stage of involvement that affected them. Outlined below are the Co-Designers' main memories from each step.

1. Walk-Through of Marc Newson Collection Exhibition

The Co-Designers remembered a few of the fixtures that either they liked or didn't like, however, the main memories were around how many of the fixtures were not designed for practical use, particularly for older people.

"There where a number of things wrong where design has not taken into account function, practical function. And I actually felt quite annoyed about that because to me good design is design which looks attractive but also meets certain criteria and if it makes something less safe or more effort then it is not good design."

2. Co-Design Workshop 1: Good & Bad (Storytelling in Role-play)

This was the first time the Co-Designers worked together in smaller groups. The memories of this session were about how working in groups enabled more ideas to be generated. They were also surprised at the commonality between the group outcomes.

3. *Co-Design Workshop 2: Future Concerns & Safety and Brainstorming*

Most of the comments about this session were about the brainstorming component and the idea of removing the bathtub. There was very little memory about the future concerns that were generated in the first half of the session.

4. *Co-Design workshop 3: Technologies and Materials*

Some of the materials presented in this workshop were remembered, especially when they came across the material, or discussions of it at some later point. The porous brick and the 3D printer were the most remembered.

5. *Co-Design workshop 4: Livability Lab setup*

The set up session made the Co-Designers more aware of the differences between their home toilets and ambulatory ones.

6. *Co-Design workshop 5: Subtask Scenarios and storyboarding*

Creating the subtask list made an impression both in how many steps it actually took to perform a task. Moreover, they remembered the individual differences and how other people could perform the same basic activities so differently. That there was no one way to do things struck them as something that came up every session and was important to recognise when thinking about bathroom design.

7. *Co-Design workshop 6 GWA Bathrooms and Kitchens design team collaboration*

The Co-Designers remembered how it was the first time the designers had had any feedback from older people and how impressed they were by it. Of the designs presented, only some aspects were remembered, such as one concept being more practical than the other.

8. *Co-Design workshop 7: Feedback on Testee Experience during Experiments*

Remembered seeing everything in 3D, walking around bathroom. They felt it was a better way of looking at it than 2D but that the colour pallet needed to be different to feel more realistic. Felt comfortable trying out these technologies.

Review of Key Findings from workshops

The Co-Designers were in agreement with the key findings. There were a few additional suggestions made, to add elements to some of the categories, such as including in *Appropriate Space* the need to have adequate space around fixtures to address the possibility of getting stuck after a fall. The Co-Designers also discussed the need for a 12th key finding relating to the need for seating in the bathroom. This has since been added.

Discussion of the lab testing and preliminary results

Discussion of what is currently happening in the lab, the initial findings and analysis of results were shared with the Co-Designers, as they have been an active part of the lab setup and pilot tests.

The input of the Co-Designers, and how it has helped to create a better testing sessions was discussed. The Co-Designers have been instrumental in making sure that the test subjects are as comfortable as possible and reduced their fatigue. Preliminary findings were also shared.

The Co-Designers were also asked for their opinion, based on their experience of being test subjects, whether they thought people would behave the same as when at home. The Co-Designers felt it wasn't too different or like they were a "laboratory mouse". For the most part, they felt it would be difficult to perform the tasks in a different way, although there could be a little variation wearing the motion capture suit. It was suggested that to check this, the researchers could review the video of people performing the tasks with and without motion capture suit to see if there's a visible difference.

One distinction noted was the lack of familiar reference points of their bathroom to help judge distance. Suggestions were made to create reference points in the lab to make it easier.

Preliminary analysis of the data showing the results of sit to stand for all test subjects was presented. The types of data collected (motion capture and sensor data) were shown as well as the methods of analysis that are being used.

The anthropometric data collected was shown comparing the average for Australia, the lab test subjects and Co-Designer were compared. The Co-Designers enjoyed comparing their data with the others and it helped them to understand the need for the various equipment and tests carried out in the lab. They were also provided with a printout of their test results to take home.

Co-Designer feedback on the Co-Design Experience

The Co-Designers were very happy with having participated in the Livable Bathroom Co-Design group. The consensus for was that it had been a terrific experience and was a great exercise, source of enlightenment and education. One Co-Designer said she “always like saying to people ‘ I’m helping to design bathrooms’”. The Co-Designers also appreciated the final wrap up session and the sharing of findings and their ability to see how their input has shaped and helped the project.

Workshop 8: Outcomes

The workshop was a wrap up of all the Co-Design sessions. The Co-Designers were presented a review of their involvement, key findings and preliminary lab results. They expressed their thoughts on each step of the experience and provided feedback on the key findings.

The outcomes of the session were:

- Review of the entire Co-Design experience
- Active participation in evaluating and providing feedback on the key findings
- Co-Designer’s positive feedback on their Co-Design experience



Researchers and Co-Designers - Workshop 8



Discussion

The Co-Design research component has been instrumental to the *Livable Bathrooms for Older People* research project. Active participation of elderly people involved their collaboration with researchers and designers as partners. The Co-Designers provided information and insight that has been not only useful by itself, but has also had a great impact on the development of research methods (see Figure 26), particularly the Livable Bathroom Survey and the Livability Lab set up and testing. Furthermore, the Co-Design collaboration with GWA has helped GWA Bathrooms and Kitchens designers to challenge existing assumptions and provide them with more understanding into the behaviour and needs of older people.

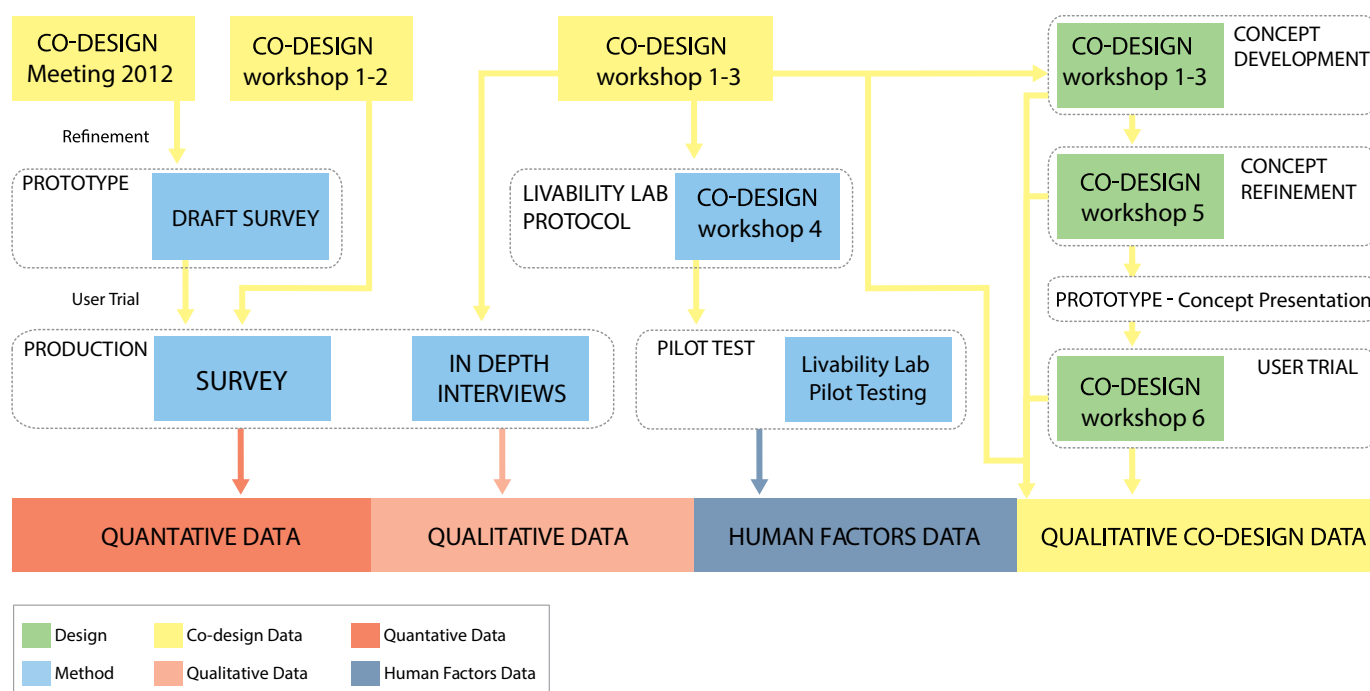


Figure 26. Relationship between Co-Design, Survey and In-depth interviews

The Co-Design group provided insight from an older person's perspective on the content and validity of the Livable Bathroom research. The advice and guidance of an involved group of older people has helped develop research methods that resonate with older people in order to achieve more relevant results for an ageing population.

The group provided guidance that helped to develop specific survey measures to capture the activities, routines and preferences important to everyday life. They have also given feedback on survey drafts that was instrumental in developing the survey. The group has also been active in the development of the Livability Lab and lab protocol, especially in relation to privacy, comfort and the acceptance of technology used for testing. Their input has helped to make the lab sessions very successful, with volunteers signing up to future testing.

The data from the Co-Design sessions, compiled in this report, is also extremely useful for future design development. It has provided data that is directly relevant to informing designers on the needs, requirements and aspirations of older people, while challenging commonly held assumptions of the target group. The usefulness of the Co-Design research was demonstrated through the concept collaboration with GWA designers to create bathroom design concepts for older people.

Working with older people has challenged researcher and designers' assumptions of older people and their needs, expectations and acceptance of change. Through this research, we have gained a much fuller understanding of what works and what doesn't work for older people in their domestic bathrooms.

Key Research Insights

Working closely with the Co-Design group from 2012 to 2015 has given us more than a better understanding of the bathroom from an older person's perspective. Using an active research method has allowed us to modify the sessions and methods of running the Co-Design workshop with the Co-Designers as needed. Some of the key learning's from our work with the Livable Bathrooms Co-Design group include:

- The importance of collaboration and sharing of information. This has been valuable in forming a fluid and collaborative environment where the researchers and Co-Designers work together and share information and findings both ways.
- The need for some additional training and education, and actively involving older people in reviewing our research and results. In order to be creative and ideate, it is important to understand what is possible. Educating the Co-Designers on new materials and technologies helped allow them to explore ideas they had never thought possible.
- Challenging common assumptions about older people. The Co-Design process has been enlightening in breaking down commonly held assumptions and stereotypes of older people.

Research Limitations

A limitation of the Co-Design research could be the small number of Co-Designers that were involved. The involvement of more people would have been beneficial to the study as it would have increased the variety of needs, abilities, issues and preferences faced by older people. In order to increase the usefulness of the information from the Co-Designers, measures were taken to separate the group into two smaller ones. However, the Co-Design research is only one component of the Livable Bathroom Project and the addition of findings from the in-depth interviews and survey data should help to overcome this limitation.

The on-going research findings from the Co-Design sessions were shared with GWA in May, 2014 with a presentation to GWA Designers in anticipation of their involvement in the following Co-Design session. Although the workshops were still taking place and more research being carried out, updating GWA more regularly may have been beneficial in providing useful information and a better understanding of the Co-Design research being undertaken.

Conclusion and Future Research

Despite the small size of the group, the Co-Design research has been valuable in challenging assumptions and providing well-defined guiding principles for bathroom design. The findings on bathroom issues can further be used to provide more in-depth information on specific fixtures. Although specifically geared to bathrooms, the findings could potentially be used to guide other areas within the home, such as kitchens.

The collaboration between older people and designers has demonstrated the usefulness of consultation with potential target markets to ensure that design solutions meet their needs. Working with an older person Co-Design group during the early stages of product development could help ensure that the needs of the target market are being met. In the future, the research team would also like to involve GWA marketing department, alongside the design team, as marketing departments are instrumental in getting designs to the market.

The Livable Bathroom Co-Designers have all expressed their enthusiasm for the project and would be willing to continue taking part in Co-Design workshops if the opportunity arose.

WATERLESS
CLEANING
(INSPIRED
FROM WATERLESS
CAR CLEANING)

GROUT THAT
WILL NEVER
GROW MOLD

EXTRACTOR
FANS
ALWAYS

ADJUSTABLE
HYBRID RAILS
& TOWEL RACKS
(HEATED)

MULTI-USE
COMPONENTS
(VANITY OVER
BATH², LIFTS
UP)

LOTUS EFFECT
ON ALL
SURFACES

RUBBER TILES
(SOFT UNDER
FOOT & EASILY
CLEANED)

SOMETHING
THAT WILL
"EAT" MOLD
(EG BACTERIA)

LOW-PROFILE
BATH SO IT
DOESN'T NEED
MUCH FILLING

HEATED
TOILET
SEAT

GOOD NATURAL
LIGHTING

~~ONE~~
FOLDING BATH
FOR EASE OF
USE

STABLE
TEMPERATURE,
CUSTOMISABLE/
INTELLIGENT

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