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Published in:
Archnet-IJAR

DOI (link to publication from Publisher):
[10.26687/archnet-ijar.v12i1.1444](https://doi.org/10.26687/archnet-ijar.v12i1.1444)

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Publication date:
2018

Document Version
Publisher's PDF, also known as Version of record

[Link to publication from Aalborg University](#)

Citation for published version (APA):
Mikkelsen, J. B., Stevens, Q., Hills, C., & Mueller, F. F. (2018). Exploring how urban waterfronts can encourage visitors' active engagement with water through a temporary design installation. *Archnet-IJAR*, 12(1), 91-111. <https://doi.org/10.26687/archnet-ijar.v12i1.1444>

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EXPLORING HOW URBAN WATERFRONTS CAN ENCOURAGE VISITORS' ACTIVE ENGAGEMENT WITH WATER THROUGH A TEMPORARY DESIGN INSTALLATION

DOI: <http://dx.doi.org/10.26687/archnet-ijar.v12i1.1444>

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Keywords

waterfront; open space;
design research;
affordances; play.

ArchNet-IJAR is indexed and listed in several databases, including:

- Avery Index to Architectural Periodicals
- EBSCO-Current Abstracts-Art and Architecture
- CNKI: China National Knowledge Infrastructure
- DOAJ: Directory of Open Access Journals
- Pro-Quest
- Scopus-Elsevier
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Abstract

Waterfront regeneration projects worldwide have transformed cities' edges into new public spaces. Although water should be the centrepiece of these transformations, users are often situated as passive observers of water; urban design of public spaces only affords distant views of water and limited possibilities for active bodily engagement and play. Formulaic urban design has often neglected the potentials of indeterminate spaces where users' desires can unfold. From these departure points, this paper uses a temporary design installation to investigate potential forms of active water engagement in a contemporary waterfront space. The installation prompts users to interact playfully with water through a variety of prototypes and devices. Observation of visitor interactions with the intervention provides data about users' desires for water engagement, in terms of three research questions concerning: engagement with the water and the marine life within it, the multiple behavioural affordances of the water's edge, and the adaptability of waterfront spaces. The study indicates the potential of temporary installations to test hypotheses and design possibilities, and thereby inform larger permanent waterfront urban design projects.

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INTRODUCTION

This paper explores the possibilities for people to engage with water within the public spaces of contemporary waterfront projects. This entails attention to the materialities and affordances of the boundary conditions between land and water; a focus which is often lacking in literature on waterfront urban design (Gibson, 1979; Hudson, 1996). The project investigates underused and mono-functional waterfront spaces as potential sites for physical engagement and play with water (Dodson and Kilian, 1998; Montag, Stiftung and Regionale 2010, 2008; Lamm and Brandt, 2012). To study engagements with water also requires investigation of the appropriations and interactions of users of public spaces on water edges (Dovey, 2005). This paper breaks with the notion of the waterfront user as a passive observer of water, and explores opportunities for facilitating active play through bodily engagement with the water environment as a unique spatial condition. Using a temporary design installation as a tool to translate between idea and implementation, the study connects design scenarios with users' desires and behaviors in public spaces on waterfronts. The temporary installation provides a method for testing hypotheses about urban design, for deriving and qualifying knowledge and direct multi-sensory spatial experience that can be implemented in future waterfront projects (al-Ibrashy & Gaber 2010).

The first section of the paper reviews recent literature on user interaction and public spaces in contemporary waterfront precincts, and relates these discussions to a specific precinct of interest, the Docklands in Melbourne, Australia. This review identifies three key research questions and a set of related aims that guide our subsequent design research intervention in the Docklands: how users of the waterfront engage with the water's surface and depth, the multiple behavioral affordances of the water, and how users might adapt waterfront public spaces after they are built. The conception, site and form of the authors' temporary waterfront installation are then described. Our analysis and evaluation of the installation's use by members of the public show that users of urban waterfronts are keen to engage actively with the water, and our intervention demonstrates some of the potentials and limitations of enabling this engagement through design.

Public spaces for water engagements

Waterfront regeneration projects worldwide have transformed cities' edges into new public spaces. The water is often noted to be a crucial element for these sites that presents a space of escape from busy and congested inner cities (Fainstein, 2000). This escapism is described as the experience of openness in contrast to dense city centers, providing a sense of freedom, ease and inspiration amongst waterfront users (Völker and Kistemann, 2013). One critique of these newly-formed urban spaces is that design regulates and limits the complex desires of users, and directs activities towards consumption and risk-free activities in a collective 'spectacle', which stimulates the senses but pacifies the body (Dovey, 2005). Furthermore, it is believed that the designs of urban waterfronts do not accommodate diversity, authenticity and democracy (Fainstein, 2000). Chang and Huang (2011) argue that the planning of urban waterfront precincts follows global formulaic approaches. Such planning is at risk of over-determining the use of public spaces. Instead, they suggest that allowing indeterminate spaces for spontaneity and diverse uses and users affords experimental approaches that might question existing uses and perceptions of public spaces on the waterfront. A unilateral focus on the physical aspects of the waterfront entails generic design. Instead, development must be content-oriented, through integrated strategies that continuously involve the users of the site (Sepe, 2013).



Following this line of thought, this paper explores the urban waterfront for indeterminate, under-used spaces that can be sites for temporary interventions which might uncover diverse user desires and new potentials for the future design of waterfront public spaces.

The role and meaning of water and its relation to the city has shifted significantly over the past 100 years, from being a practical, material necessity for industrial activities, to much more indirect uses of water in the context of leisure. Gordon (1996) defines five key criteria for successful waterfront transformation, and one of these is the importance of connecting to the water. Yet much analysis of urban waterfront regeneration focuses on how the projects are carried out, and the role that the new buildings and uses have in economic development. In this context, improved access is usually explored only in terms of access to the waterfront development, through new promenades, bridges, and river taxis, rather than to the water itself. Additionally, visitors' experience of water is expressed in terms of views and the ambiance of the built form, rather than activities that involve close contact with water (Stevens et al, 2016; Jones, 1998; Sepe, 2013). It is relatively rare in the design literature that waterfront regeneration projects are criticized for having a vague relation to, and use of, the water, for focusing mainly on visual sensory experiences, for neglecting other sensory impressions and for preventing direct bodily engagements with water (Macarthur, 1999; Stevens, 2009; Rahman and Imon, 2017). In their documentation of user well-being in leisure experiences of waterfronts, Völker and Kistemann (2013) stress the importance of allowing users to get as close to the water as possible. The experience of water is predominantly visual, through movements and light effects on the surface, but water also affects other senses through its smell, the sounds of waves and boats, the sensation of winds coming across water, its moderating effect on microclimate, and opportunities for paddling and swimming. Furthermore, water spaces hold significant potential as therapeutic landscapes for the well-being of urban dwellers (Foley and Kistemann, 2015). However, most urban waterfront designs appear not to support active engagement with the water, and instead constrain people to a role as passive observers (Stevens, 2009).

The public spaces of Melbourne Docklands

The Docklands precinct is a much-debated part of Melbourne. The planning process of the area has been criticized for a lack of public involvement, its discrete, partly privatized governance arrangements, and its generic outcomes (Dovey, 2005), which conforms to the critiques of many other cities' contemporary waterfront regeneration projects (Oakley, 2014; White, 2016; Desfor et al, 2010; Gordon, 1996). While visions of integrating water into the Docklands precinct through canals and programming were presented through plans and visualizations, these master plans were not legally binding, and construction followed loosely-defined plans largely driven by private investment (Dovey, 2005). The outcome contains built spaces and functions such as shopping malls and stadiums that are only vaguely connected to the water, and privately-owned promenades. The project has failed to develop the Victoria Harbour waterfront as the centrepiece of the precinct, and has created large building plots with little accommodation of diverse places and users (Dovey, 2005). Recent analyses have criticized the precinct for lacking small scale spaces, water access and engagement with water, and possibilities for users to interact with, alter and appropriate urban spaces in order to create a sense of community and place in Docklands (Gehl, 2010; Douglas & Monacella, 2012).

Our own first-hand analysis of the waterfront public spaces in Melbourne Docklands was based on theoretical literature, previous analyses and recent planning documents, which

provided a list of key critiques. The area of study was limited to the quays and connected public spaces surrounding Victoria Harbour. A map annotated with key points of interest guided the on-site observational studies. With the prepared documents and preliminary formulated research questions the researchers performed a walk-through analysis around the edge of Victoria Harbour, starting at the newly constructed public library and ending at the most recent developments on the harbor's opposite side. Several specific sites were revisited to undertake additional studies of user behavior at different times of the day and under different weather conditions. The initial walk was repeated as a walk-along interview with a local researcher who had done in-depth study of the Docklands area, to further gain understandings and reflections on the area.

The design of public spaces in Docklands was explored in terms of the relation between users' desires and spatial affordances (Stevens & Dovey, 2004). The analyses showed that the public spaces along the quays in Docklands are appropriated in different ways, which reveal diverse understandings, readings and desires. One example is the use of the benches in the waterfront public spaces, and how these are appropriated in multiple ways, including ways they were not designed for (Whyte, 1988). The following examples illustrate the complexity in the uses of these spaces. As a bench was orientated away from water, a man was observed turning around to face the water using a curb as footrest. Another bench lacked a backrest, resulting in a couple sitting on the ground, using the bench as backrest, instead of sitting on the bench seat. Some street furnishings in Docklands comfortably afforded sleeping; others were not comfortable to sleep on but were used for this purpose anyway.



Figure 1: Users appropriating benches in Docklands (Source: Authors).

Another prevailing critique of the area is the lack of smaller, intimate and diverse spaces (Gehl, 2010). The Docklands is said to lack 'fine grain' and atmosphere, being dominated by buildings with large footprints (Gehl, 2010; Lynch, 1981). Some small-scale enclosures exist; for example, a small-scale, intimate space on the Victoria Harbour Promenade (along the south quay of Victoria Harbour). This space is near the water and defined by columns and an overarching pergola. The enclosure provides space for self-expression in public space through people's markings on walls and benches – traces not seen in the open parts of the promenade. Hence, the enclosure creates space for private emotions to be expressed in public settings. Another relevant space was found on the Harbour Esplanade on the eastern side of Victoria Harbour. The wooden structure found here provides a space for self-expression through the privacy provided by the small enclosure. The wooden material affords writing, tagging and carving. The writings on these walls reflect a social diversity, through the use of different languages, alphabets and modes of expression, as well as the content. Though this is a minor space in the larger urban landscape, it supports social interaction in the Docklands area. It also reflects some of the critiques of the lack of social diversity of



users in Docklands, and recommendations for its urban spaces to afford more human interaction, as discussed above. Several notes that people have left here express discontent with the area - the space functions as a forum for public debate of the city. The space thus provides a possibility for expressing feelings about the Docklands, a precinct which was also criticized for a lack of public involvement in its construction phases. This space deviates from the general critique of the area as lacking social identity and sense of place (Douglas & Monacella, 2012). Such spaces can also be perceived as having a potential for nurturing urban diversity in the fringes and interstices of formal urban spaces (Stevens & Dovey, 2004).

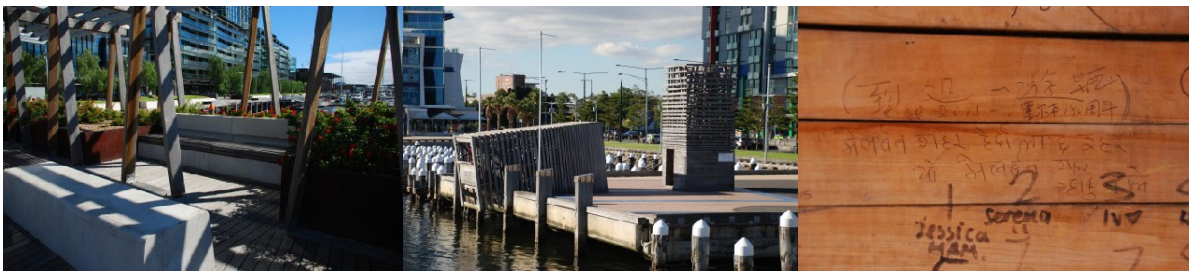


Figure 2: Intimate space on Victoria Harbour Promenade, and wooden structure on Harbour Esplanade (Source: Authors).

Site analysis of water accessibility in Docklands

Analysis conducted through studies of maps and on-site observations revealed that the Docklands promenades are separated from the water by a series of different boundaries. Several of these boundaries are formed by berthing pontoons used for mooring sailboats. As these berthing areas are organized through private clubs, most of them are sealed off from the public, resulting in very limited public access to the water. Our count found that over eighty percent of the more than 200 berthing points in the Harbour are sealed off, only accessible with a membership card. Other boundaries are formed by pavilions placed on the edge of the promenade, blocking views and access to water, which was evident at street level along the promenade and along adjacent streets leading to the promenade. These pavilions are used by upmarket restaurants, which increase social stratification on the water edge.



Figure 3: Map of Melbourne Docklands (Source: Authors).

The water access at Docklands is therefore delimited in various ways, even though recent planning documents for the area note that water should be an essential feature of its public space designs (Hassell Ltd., 2015:28). Because the Docklands area has poor connections to the waterfront, Gehl (2010) has recommended designing ways of getting closer to the water and supporting a wider spectrum of water activities. Figure 4 shows an example of users' desires to get close to Docklands' water and study its marine life.



Figure 4: Users appropriating berth pontoons and showing interest in its marine life (Source: Authors).

CREATING AN INSTALLATION TO INVESTIGATE WATER ENGAGEMENTS

On the basis of the analysis of Docklands outlined above, the design phase of our research employed a temporary installation to investigate the boundaries between urban land and water. The installation process followed an action research method to investigate the Docklands area and the connections between its public spaces, users and water.

The temporary installation focuses specifically on edge materialities and the affordances these could provide for engagement with water. The aim of the installation was to investigate design potentials and user desires for water engagement in public spaces along the water edge, to inform the design of future urban spaces. This included the installation and evaluation of objects and devices on-site to test proximity and engagement with water. It also involved documentation and assessment of user experiences to improve understandings of the problems and potentials of the site and the Docklands precinct as a whole. The installation was therefore designed to produce data on how people engage or desire to engage with water, and to obtain their feedback on the installation, so as to contribute to the development of parameters and criteria for the future design of more engaging urban water spaces at various scales. While the research project's core focus was within the field of urban design, the research team also include researchers with expertise in user experience and game design research, who introduced a further range of ideas and technologies for active water engagement.

The installation had an experimental approach, to pose a set of questions instead of providing specific answers. The following three research questions are investigated through the installation. The first question relates to users' desires to engage with the natural properties and biological contents of water, and the current constraints on such possibilities in the Docklands. The second question considers the multiple user desires in the area and how these can relate to water. Hence, it concerns the investigation of the affordances of water and potentials for water interaction in public spaces on the waterfront. The third question concerns the overall installation approach, and addresses the lack of public

involvement and the limited possibilities for interaction in the area, as outlined in the site analysis. This question thus investigates the potential of users appropriating and adapting public spaces in the area, and the use of ephemeral installations as a methodology for testing and informing design. The research questions are:

QUESTION 1: How can the installation enhance experience of the water at the Docklands, as one of the city's largest natural environments? In particular, how can it enhance the waterfront precinct's vertical connection with the water's surface and the depth below it?

QUESTION 2: How can the installation investigate and nurture the various experiential and behavioral affordances of water?

QUESTION 3: How can we create adaptable public spaces that engage users in ways that allow them to inform the design of future waterfront spaces?

Within our temporary installation, research question one is investigated through prototypes that let participants focus on specific elements of marine life in its natural setting, thereby enhancing experience of the nature qualities of the water. The second question is investigated through the installation of interactive play objects that operate in the water, as a tool to prompt interaction among users and between users and water. The third question is investigated through the overall installation approach, and its introduction of a range of moveable and adaptable objects. The activities of visitors to this installation were documented through users' written and drawn feedback, supplemented by participant observation and semi-structured interviews. The results are presented in relation to future design possibilities for urban waterfront precincts. The following section outlines the installation elements in detail.

The temporary installation

A set of small wooden crates that offered varied interactive experiences were developed and installed on a waterfront site in the Docklands for one day in May 2016 so that participants' reactions and responses could be observed and recorded. The crates were distributed across a carpet of synthetic turf, and participants were invited to interact with them. The crates were designed to prompt people to feel or do things with water and explore their own relation to water, so that the research team could learn more about their experiences of and reactions to water in urban spaces. As design research, this installation should not be considered as providing definitive answers about waterfront public space, but rather as an experimental tool to explore a set of questions. The installation used wood and a soft carpet of artificial turf to contrast with the hard concrete and steel of the existing waterfront space and to draw attention to the intervention. The use of wood was inspired by our observations about user behavior in the existing waterfront wooden structure outlined in the site analysis above. The introduction of artificial turf responded to our observation of users' desires to sit and lie down on the mostly-concrete surfaces in Docklands; a softer material was therefore investigated to explore ways of accommodating these desires. Figure 5 provides an overview of the developed prototypes and devices employed in the installation. The different parts of the installation were all developed from the discussions of theory, critiques and analyses above and the three key research questions derived from these insights. Extended reflections on the relation between our site analysis, research questions and the various physical elements of the installation are provided at the end of this paper. The installation consisted of the following elements:



- a 'water telescope' and a 'water periscope', enabling visitors to see marine life under the water surface, related to research question one.
- a water robot remotely controlled by a waterproofed tablet computer floating in a crate filled with water, related to research question two. The water robot could be manoeuvred through a custom-made track floating on the water.
- a miniature diorama of the waterfront installation made from interlocking plastic bricks, enabling visitors to alter the design of the waterfront, related to research question three.
- a feedback crate for collecting feedback on the installation through survey sheets and drawings on the sides of the crate.

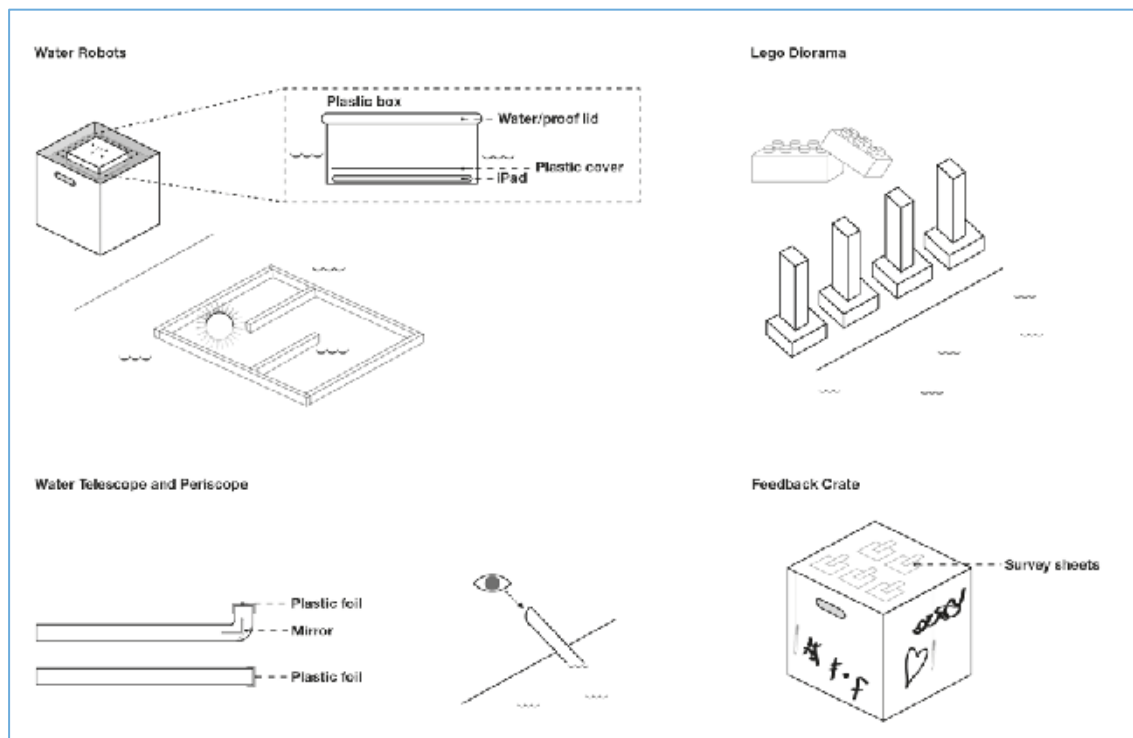


Figure 5: Diagrammatic overview of installation elements (Source: Authors).

The use of interactive robot play objects

The interactive play objects used in the installation were two water-resistant self-propelled 'Sphero' robots. These spherical robots were given removable, colorful, rubbery silicon covers that looked like jellyfish or sea urchins. The covers had textured surfaces that allowed the robots to gain traction in the water when movement was invoked by a controller, giving them a fish-like locomotion. The robots were remotely controlled through an application on a touchscreen tablet computer. The tablets were sealed inside plastic boxes to make them water resistant. The tablet application allowed participants to control the robots' direction and velocity remotely from the harbor pier, by tilting the tablet to engage the tablet's built-in accelerometer. The robots were immersed in water where the participants could see them, either in the water next to the pier or in one of the installation's crates. The intention was to enable participants to touch the robot in the crate and play with it, and to experience the tactility of the object in the water, which appeared to be a kind of artificial sea creature.

Additionally an interactive game was framed by the placement of the water robots within a winding course that was marked out by a tethered timber frame floating on the harbor surface adjacent to the installation.

The selected site

We selected the site for our installation for the following reasons. We wanted low-level access to the water in order to maximize possibilities for water engagement and test interactive play with water objects. Therefore the site needed to be on a publicly-accessible mooring berth, as the wharfs at other locations within this tidal harbour are more than two meters above the water. Only two sites met this key criterion. Secondly, the site should provide space for the investigation to unfold with minimal impact on other uses. Thirdly, the site needed to be connected to a significant flow of people to engage potential participants. We therefore selected one of the few accessible berth pontoons. Our previous studies of this area showed that empty berths hold potential for other uses beyond merely mooring boats (see fig. 4). In these studies, users were observed to have a clear interest in what is under the water surface, and through their actions they were testing multiple affordances of the berthing site. This site represented a rare opportunity in Docklands for getting close to the water, and for rethinking a space that was designed merely as a transit zone between the waterfront promenade and boat transport. But, as our observations showed, the site is already used for activities other than boarding and unboarding. It was therefore interesting to explore the berth as something more than a transit zone, where one moors a boat and walks straight up onto the promenade. This also presents a challenge, as it could take more than one day for people to imagine the berth as a place for a range of other activities.

The selected site for the installation was challenging in terms of accessibility and visibility. Key problems with the design of the berthing area and the adjacent waterfront related to how people approach it along a convoluted zig-zag of stairs and ramps, and the positioning of restaurants and cafés blocking visual and pedestrian connections from the promenade down to the water. Another consideration was the amount of water movement, which affected the ease of controlling the water robots in the harbor as part of the installation. The range of activities and visual stimulations available on the Harbour's upper promenade also prevent people from seeking out the empty berths or the water. These challenges of the site reflected the broader issues identified with water access within the Docklands.

The specific site chosen on the berth pontoon was approximately 3 meters wide and 5 meters long, has water on three sides, and is visible from several points along the Harbour's main pedestrian promenade. The site was suitable for the installation because it is close to water, the pontoons enclose a small basin for the robots and other interactive objects to be placed in, and the pontoon's anchoring poles and framing are inhabited by easily-visible marine life. We also note that the installation could not impede the main function of the berth, namely allowing people to move freely between the promenade and the moored boats.





Figure 6: The site at the end of the west berth pontoon on New Quay, Docklands (Source: Authors).

Recruiting participants

In total 43 individuals visited the installation between 11.30 am and 4:30 pm on a Sunday in late Autumn, in 10 groups. This sample appeared to represent common users of the promenade in terms of age and gender, with a majority being families with young children. The participants included 17 children between the ages of 1 and 6 years and 17 adults in the range of 30 to 40 years. Other groups included young adults (2 couples and one individual

aged 20-30 years) and elderly people (4 individuals aged 70-80 years). The fact that only small groups visited allowed the researchers optimal opportunities to engage in conversation with participants. It also allowed participants to spend more time at the site, because there was not a line of people waiting to access it. The fact that there were pauses between visits also allowed the research team time to reset the installation and discuss what was learned from the previous visit. For example, technical problems with the water robot were resolved during these off-times.

Most participants came down to get close to the water without solicitation, and therefore it was easy to engage them in the installation, as they already had interest in the water. Some participants also came down while the research team was setting up the installation, and some noted that they had seen the installation being constructed earlier in the day and became curious and wanted to explore it. Hence, the act of setting up the installation generated attention and curiosity among potential participants. Participants were particularly attracted by the opportunities for play offered by the installation, including the use of the water robots, the ability to look under the sea with a mirror and pipe construction and the population of jellyfish in the adjacent water.

The role of the construction phase in raising public attention confirms findings from an earlier temporary intervention project in Melbourne's Docklands by Douglas and Monacella (2012). On several occasions our researchers went up to the adjacent harbor promenade to promote the installation, in order to recruit additional participants. This was regarded by some potential participants on the promenade as a marketing activity, despite the researchers explaining that this was a research study. Additionally, the researchers were not able to easily point to the installation from the promenade, as the installation was obscured by buildings from the part of the promenade closest to the berth. Recruitment of participants was positively affected by a coincidental birthday party in the adjacent restaurant. The birthday party was attended by families with children, and as the research site was visible from the room where the party occurred, children at the party became curious, and many participants came from this source, which assisted the researchers with snowball recruiting of further participants. The party room was separated from the water by glazing, walls and level changes, and the installation therefore provided the children with a focus point, an attraction on the waterfront that presented a space in contact with water.

Data collection methods

Data was collected through photographing, video recording and audio recording of participants, written and drawn comments produced by participants on provided paper sheets, and written and drawn observations by the researchers. A video camera recorded the participants for the duration of the project. This was done to document situations unfolding over a longer time span, to document which crates were used most, and to document changes to the installation through the day, for example when participants moved crates to create seating arrangements. Semi-structured interviews were conducted during and after the participants' visits to the installation. The questions elaborated on the key research questions above. The first research question, concerning the water as a natural environment, was transformed into the prompting question: *'Did you learn anything new about the urban water as a natural environment in Melbourne?'*. The second question on the affordances of water generated the prompting question *'Did the installation reveal potentials of water and diverse uses of the water that you didn't know about and hadn't thought about before?'*. The third research question on adaptable spaces was transformed into the question: *'Did you change the setting of the installation, for example by moving the crates?'*

Additionally, the participants were prompted with several sub-questions about preferences and wishes regarding the design of waterfront public spaces. The interviews also explored the positive and negative aspects of living in Melbourne Docklands, as well as asking participants about their preferences by describing their favorite waterfront urban spaces elsewhere in the world, and what specific qualities those spaces have.

A feedback crate was placed at the entry/exit point of the site, near an existing bridge that connects the pontoon to the pedestrian waterfront promenade on land. This crate was designed as a combination of a mailbox and a drawing board. Participants could write or draw their impressions either on the side of the crate or on paper sheets to be put inside the crate. These sheets contained one printed question based on a simplified version of one of the research questions above, accompanied by a picture of one of the crates, to evoke responses to the installation:

(Research Question 1) Water Telescopes and Periscopes:
What did you see and did you learn something new?

(Research Question 2) Water Robots:
What was your experience of playing with water and the robots?

(Research Question 3a) Plastic Brick Diorama:
Did you change the diorama? What did you do and why?

(Research Question 3b):
Did the installation make you aware of your preferences for the design of public spaces in Docklands?

The participants remained anonymous, but were asked to provide their gender, age and residential postcode on the sheet.

ANALYSIS OF THE INSTALLATION

The following analysis of the installation is organized according to the three research questions outlined above. It draws together the various data obtained to formulate themes for conceptualizing water engagements on urban waterfronts.

Scoping Underwater Environments

The first research question, about how vertical connections can enhance people's experience of the water as one of the largest natural environments in the city, was investigated through the installation's location on a low pontoon and through the water telescopes and periscopes. These devices were mainly used around an anchoring pole on the site, as researchers encouraged participants to look at the poles to investigate the marine life around them. Several participants also found interest in the numerous jellyfish swimming freely in the shallows of the water, though these were harder to observe through the telescope because of distance. One practice often observed was an adult locating an animal or plant with the telescope and then letting a child look while the adult held the telescope still. Other participants simply held the telescope while their children used it to freely look around. Some children also ventured by themselves along the edge of the pontoon. This indicated their studies of the underwater environment, which on several occasions resulted in the discovery of something exciting. One boy who was looking for an extended period suddenly

made a discovery, causing him to jump and yell: 'I saw a jellyfish! I saw a jellyfish!'. Another boy had a similar reaction after seeing a fish. These outbursts would draw the attention of other participants, and on several occasions they gathered around the discovered creatures, forming small groups with shared interests in what was under the surface. The participants would crouch on the pontoon or even lie prone to get a closer look. One boy was also observed borrowing from the installation the fishing net intended for retrieving the water robots and trying to catch the living animals he was observing, thereby appropriating the provided equipment to interact further with the water environment. Interviews with the participants revealed their desires to get closer to the water and to explore the marine life of the harbor. One man reflected on his diving experiences elsewhere, and how these kinds of experiences could be brought into the urban space and make the underwater 'world' visible:

'I just want to look down and see how it looks, because I have been to Cairns [in tropical northern Australia], where I did a scuba dive and saw a different world altogether. You can see the mullets, different fish and plants – it's a different world altogether. Above the surface we can't see that...' (Man, 30 years old, living in Docklands for 4 years).



Figure 7: Participants using water telescopes and periscopes alone and in groups (Source: Authors).

The water telescopes made participants aware of the water as a natural environment in the city, and gave them a tool for investigating and further examining a variety of plants and animals in the water. The installation provided some printed learning material on the different animals that could be seen in Melbourne's aquatic environments, so that visitors could compare what they saw to what was on the provided material to enhance their learning about marine life, biology and nature. This part of the installation also engendered interaction among visitors, and some level of competition to find animals and plants. Furthermore, participants who did not use the telescopes still tried to look down and observe the marine life with the naked eye. Thus the telescopes seem to have brought more attention to the water in general, and evoked discussions and interaction between participants about water as a natural resource and its characteristic marine life. The installation indicated the broad potential for making what is under the surface more visible and more engaging.

The water telescopes and periscopes seem to have 'scoped' certain aspects of the underwater environment, and enabled users to focus and more closely study specific kinds of marine life in their natural setting. In this way, the devices augmented the edge of the waterfront and enhanced visibility and proximity between users and the water environment, helping to reveal it as a place rich with distinctive contents and qualities. Together with the

learning materials on marine life, this generated in-depth understandings about the underwater environments that exist adjacent to waterfront urban developments.

Prompting Surface Interaction

The second research question, on the affordances and multiple uses of water, was mainly investigated through the introduction of water-based robots as a playful mediator between users and water. The game setup, based on two 'Sphero' robots with jellyfish-like silicon covers, involved participants remotely steering the robots through a marked course that we had set out on the water surface next to the berth. This challenge was undertaken by the first group of visitors, a father and his 5-year-old son. Firstly, they were invited to touch the water robot and get a sense of its soft 'skin'. After they initially tested the water robot in the water crate by tilting a tablet controller held directly in their hands, the tablet device was packed inside a watertight box and placed on the water surface inside the water crate. The screen of the tablet device was covered over so that the users would focus on moving the box by touch and observing the water robot, which was then placed in the winding course floating on the harbor surface. The tablet control box was mainly operated by the father, because the child initially found it difficult to control. At first the father kept the box on the water surface inside the crate full of water, but as the box required a lot of tilting to move the water robot, he eventually lifted the box above the surface to get a better grip. This disrupted the research aim of using the remote control game to bring participants into direct bodily contact with water. The configuration of this installation could probably be improved through further studies of the sensitivity settings for the control tablet, so that less tilting is required to move the water robot. Several other participants also operated the water robot with the tablet box in their hands instead of in the water crate. One man was observed moving his entire upper body to tilt the tablet in the right direction. His determination to make the water robot move in the right direction seemed to make him unaware of his extreme bodily movements, which were not actually necessary to tilt the tablet. By setting his entire body in motion, the participant also showed his intense engagement with the game.



Figure 8: The water robot in its custom-built course. To the right, a young man is controlling the water robot through a floating box with a tablet controller inside, which he cannot see (Source: Authors).

Practice was necessary to steer the water robot through the course, and it would usually take participants several tilts to each side and several unintended detours before they developed adequate control of the water robot. After they had gained control, they generally showed more satisfaction and enjoyment in the experience. One participant reacted by shouting

'Woo-hoo, go for it!' as he figured out how to make the water robot move in the right direction.

The research team experienced numerous technical issues with the water robot, including signals from other devices on the harbor interfering with the connection to the tablet and the robot's very short battery life. However, during the periods of dysfunction and recharging, participants were still observed having a range of interactions with the non-active water robot, as well as engaging with the removed jellyfish 'skin' of the robot while it was out of the water being recharged. The water robot could be interacted with in water within the safe and confined environment of the water crates, which seemed to ease parents' protective concerns for their children's safety. The water robot helped draw participants' attention to the water, and it triggered immediate curiosity and a desire for engagement from participants, especially children. The important role of this animated object was evident where users would only interact with the water crate with a water robot in it, and not with a crate that only contained water. The water robot evoked curiosity and facilitated water engagement. Rather than visitors just putting their hand in the water, the water robot object enabled enhanced experiences of water, where the sensation of water on skin was an inherent part.

The animal-like appearance and tactility of the water robot skin, when removed from the Sphero during charging, seemed to enhance its attractiveness for play. It appeared to be frightening to some participants, who thought it was a real animal. Before operating the water robot, participants were invited to hold it in their hand. The water robot vibrates when it is switched on, which makes it livelier. Explorations of the water robot gathered several participants around the water crates at the same time. Several participants lifted the water robot by one of its 'tentacles' to test their elasticity. One boy was observed approaching the water robot in a crate three times and touching it briefly, getting his hand wet in the process. With help from one of the researchers, he then dared to pick it up to investigate it further. On other occasions, children played with one water robot in each crate and discussed with each other how the robot felt. The characteristics of the water environment inside the crate were also explored through the water robot. One boy was observed taking the water robot skin out of the water and throwing it back in to make the water splash. One girl squeezed water out of the water robot skin, and when asked how it felt, she replied 'Squishy!'.

The water robots, as tangible objects immersed in water, were observed to have prompted a range of both direct and indirect interactions with the water's surface and substance. These objects presented tactile and 'animal'-like qualities and appeal, which sparked curiosity and prompted participants to further investigate both the robots and the water they moved through. The water robots' mobility facilitated new types of interactions between the participants and the water. The water robots were 'in-between' objects, in between the live fish and jellyfish that participants could observe using the periscope (but could not touch) and the inanimate physical objects sitting on the berth, such as the crates. The water robots were 'alive' in the water, yet were controllable to some extent and could also be touched by the participants. In essence, the water robots facilitated vicarious contact with water and presented new ways of exploring the water's various properties. This activity evoked emotions and thereby overcame visitors' indifference about water. These emotional responses to the design installation raise challenges and opportunities to conventional urban design solutions which are typically static and leave visitors passive, and where water is kept at a distance.



Figure 9: Child interacting with water robot skin in water crate (Source: Authors).

Unfolding Waterfront Multiplicities

The third research question, regarding appropriable and adaptable spaces on waterfronts, was investigated through several elements of the installation. The manipulable diorama model of the installation made from plastic bricks was part of this investigation, although it was a less prominent element and was not emphasized in the introduction that researchers gave to participants. Several participants were observed interacting with the diorama and sitting on the artificial turf next to it, but they did not seem to be aware of the research intention that they should use these materials to imagine alterations to the design of the waterfront. The diorama did however provide a space for free, un-choreographed playful activities on the site. This was facilitated by the simple expression of the diorama and the provided box of loose plastic bricks. Participants were observed building from their own imagination, without any introduction or guidance from researchers, and forming informal groups around the practice of building with plastic bricks – an unusual activity in a waterfront context.

Another broader way to explore this question was through the open invitation for visitors to interact with any part of the installation. This proved to be hard to realize under the practical circumstances on the day of the installation. Each different part of the installation required its own introduction, and therefore the researchers had to direct participants to one specific part of the installation at a time. Larger groups were easier to divide, especially in the case of one larger group, which became increasingly familiar with the installation and was then observed taking the water telescope to the eastern edge of the site and searching in the water by themselves. Another larger group showed similar behavior: two parts of the group were occupied with the water robots and with the water telescopes, and a third part wandered through the installation on their own. One girl lost interest in the water robot and started playing with the plastic brick diorama, and another boy periodically joined her.



Figure 10: Children using the plastic brick diorama (Source: Authors).

The artificial turf laid onto the surface of the pontoon was another element that seems to have afforded playful uses. Several children were observed sitting on the turf and playing with the plastic brick diorama. A boy ran towards the diorama and slid on his knees to reach it – an act that would have been very painful on the bare concrete surface of the pontoon. Other practices include kneeling or lying on the turf to see into the water, both with and without the water telescope. This practice is also possible on concrete, but is more pleasant on a soft artificial turf. The several un-programmed crates provided as informal, moveable seating were also rearranged by participants to support their activities - for example by placing them in front of the water robot for a more comfortable interaction.



Figure 11: Installation overview (Source: Authors).



The feedback crate was a key element for documenting the participants' activities; it was mainly used by children, serving as a small drawing table for them to gather around. The returned survey sheets mainly consisted of drawings on blank sheets depicting animals that the children had discovered (mostly jellyfish). The research team observed that the serendipitous presence of jellyfish around the installation elicited expressions of fascination and joy from many participants. Some feedback concerned the water robots and the experience of playing with them. A mother stated her interest in using the water telescope to observe and study sea creatures up close. The prototype provided her with close contact to the marine life, and made her aware of her own interest in life under the water's surface. One father commented on the intuitiveness of the water robot game; another commented on the innovativeness of presenting a participatory game in this waterfront context.

The researchers had not predicted the observed activity of participants drawing directly onto the side of the feedback crate. This crate was presented as a table where survey sheets could be filled out on top when sitting or crouching. If participants has been able to spend more time at the site, we imagine that more participants might have been aware of opportunities for drawing on the box itself, as we had observed in site analysis of the larger existing wooden enclosure on the other side of the harbor.



Figure 12: Children gather around feedback crate to draw
(Source: Authors).



CONCLUSION: FUTURE DESIGN PERSPECTIVES FOR URBAN WATERFRONTS

This design installation at the Melbourne Docklands employed a variety of physical elements, devices, and opportunities for action to investigate the potential enrichment of the interactions between open space users and water, in relation to three key themes. Firstly, the water telescopes and periscopes expanded the visual scope of users' engagement with the water's edge. They allowed participants to 'scope out' marine life, revealing what is under the reflective surface through a range of investigative and interactive practices. These devices broke through the boundary that conventional urban design often establishes between urban waterfront visitors and water, and investigated closer proximities between them. These small prototype devices revealed users' desires to investigate marine life. Such ideas could be translated and tested in the design of larger constructions, for example the kinds of semi-submerged, glass-walled spaces that are generally only used in paid-entry aquarium and zoo exhibits.

Secondly, the water robot objects prompted interaction with the water's surface, evoking both curiosity and emotional responses. They enable an indirect, vicarious form of sensory contact between users and this natural element, thereby affording opportunities to explore water's properties of texture, depth and motion. In this study, placing curious objects into water, both motorized and floating, prompted users to get their hands wet. This too might be translated into other, larger interventions. The robots overcame people's typical indifference and lack of contact to water as a material, and challenged the constraints of conventional, distancing urban design solutions. Further waterfront design research could probe full-body immersions that position visitors even further down, closer to, and more richly immersed in the element of water.

Thirdly, the varied materials and forms of the installation 'unfolded' the potential multiplicities of the waterfront, and of users' desires, by providing a wide range of surfaces and objects that offered multiple options for appropriation and adaptation. Through interviews and surveys conducted within this setting, and participants' use and reorganisation of the various devices, the design installation provided space for users to perform and express their opinions and feelings about the presented experiences and ideas, and about waterfront design in general, as a means to inform future urban design solutions. In this way, the installation showed the potential of engaging and involving the public on-site with the materials at hand, instead of constraining them to reviewing abstract planning documents in a location far removed from the actual spatial context.

In these three ways, this study contributes methodologically to how urban design practice and research might translate between ideas and concepts and their implementation in built form. Drawings and other visualizations present hypotheses about urban life and user engagements in public space that typically have to be accepted or rejected at face value. Engaging users in temporary installations that physically manifest these ideas can test their potentials and their probability of success. While the duration and number of participants in this study was limited, the intervention discussed here demonstrated that ways of engaging users with water can be quickly and cheaply trialled in the context of an existing waterfront space. The project confirms other recent research (Bishop and Williams, 2012; Hou, 2010; Stevens, 2010) indicating that such installations can yield useful insights into design concepts and user desires that can inform future large-scale urban design projects, and their implementation processes.



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