# Communicating CulturALL: A Project on the Multi-Sensory Panels Located within the Churches of Venice

An Interdisciplinary Qualifying Project report submitted to the faculty of Worcester Polytechnic Institute in fulfillment of the requirements of the Degree of Bachelor of Science


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**1 May 2024**

# Abstract

Regardless of circumstance, all individuals deserve to learn the importance of cultural heritage. This report details our work with the Rotary Club of Venice, Italy to help expand their CulturALL initiative, a program dedicated to making culture and art accessible in unconventional ways. We aided them by collecting and analyzing observational data on the usage and state of their multisensory panel installations within nine of Venice's churches. We then created an accessible website to make the information from these panels available online to all. Finally, we devised recommendations on how current and future goals of the CulturALL initiative can be improved.

# Acknowledgements

Throughout the two terms of planning and executing the project we received a lot of important guidance and feedback from many people.

To start, we would like to thank our two advisors, Chrys Demetry and Rick Vaz. Throughout our meetings in ID2050, PQP, and IQP they played instrumental roles in our research, writing, and project development. Without their useful feedback and aid we would not have been able to pull off the noteworthy work we conducted.

Secondly, we would like to thank Fabio Carrera for his knowledgeability of Venice and helping bridge the gap between us, our sponsor, and other organizations involved in the project. Without his help in meetings where Italian was the prominent first language, much could have been lost in translation but instead he was able to ask the questions that we needed and accurately give us answers. We also appreciate his insightful feedback on both the website demos and presentation practices.

We would like to thank the host of our trip to Aquileia, Italy Raffaele Caltabiano for giving us a tour of all CulturALL implementations within Aquileia. He gave us insightful information on how CulturALL is being implemented outside of Venice.

We would like to thank Leonardo De Carlo, architect of the multisensory panel lecterns, for giving us his valuable time for a meeting to answer our questions. His insight was invaluable to informing our recommendations and the project would not be the same without him.

Lastly, we would like to thank our sponsor from the Rotary Club of Venice, Elisabetta Fabbri. Elisabetta was crucial in aiding our understanding of what was needed of us to start and implement the project. She gave helpful feedback on the data collection and website as well as got us in touch with other organizations and individuals that were relevant to the work we were doing.

# Executive Summary

Culture defines a community. It is an essential part of human life and helps us to further our understanding of one another. Everyone should be able to experience different cultures; however, the means through which culture is displayed is not always accessible to all. Those who have disabilities may face challenges that make it hard to learn about and experience the culture of other communities or even their own.

In Venice, Italy, the city's Rotary Club (RCV) started the CulturALL initiative, which focuses on making art and culture accessible in unique ways. The first CulturALL project involved installing multi-sensory panels into churches around the city of Venice, to help make art more accessible to those with disabilities. These panels include embossed images and braille text to help people orient themselves within the space. Additionally, there is an audio-visual option as well as an interpretation in international sign language. The goal of this project was to further the CulturALL initiative of Venice's Rotary Club by recommending improvements to the existing and future multisensory panel installations and providing greater access to the information on the panels present.

To achieve this goal, we used the following three research objectives:

1. Evaluate panel usage and condition.
2. Develop means for making the information on the panels widely accessible.
3. Present recommendations for future CulturALL panel installations and dissemination.

## Methods

The first step of the project was to take inventory of information based on observations and data collection. There are nine churches in Venice that have RCV multi-sensory panels in place. Using an organized protocol, we conducted visitations and observations at each of the nine churches.

The distinct groups of information we had collected included:

- **Usage data:** during one-hour morning and afternoon observations we determined the total number of visitors to the church as well as the number of visitors who interacted with the panels. For those that interacted with the panel we recorded what features they used, time of interaction, and their estimated demographics such as age and gender.
- **Physical condition of the installation:** During these visitations we observed and photographed physical characteristics such as stability, location within the church, and cleanliness of the panel.

- **Church-Specific Data**: Photographs of the exteriors and interiors of each church were taken, along with photos of scratches/marks on the panel and lectern, and any failure of the adhesive connecting the panel to the lectern.

Through the observations and data collection we hoped to have a better understanding of the usage of the maps, based on the time, location, and demographics. We also wanted to learn about the physical state of all the panels and make note of problems that exist within the structure or on the panel itself.

The second aspect of the project was a website meant to store panel information and be used by all people. The website needed to be both accessible and informative about the CulturALL initiative plus how to expand it. To make the website as accessible as we could, we adhered to detailed criteria based upon both American and European standards for web accessibility.

The third and final aspect of the project uses the data collected from the churches and panels to recommend improvements to CulturALL addressing use, condition, and structure. These recommendations also consider the information we learned from visiting the installations in Aquileia, Italy and meeting with architect Leonardo De Carlo.

## Findings

Based on the data collection and observations conducted, we found the following:

**Our observations suggest that the panels oriented facing inward toward the church, along the axis of symmetry, and in sight once entering the church, were easily noticed and had the highest user interaction.** In churches like the Basilica Della Salute, the panel is placed in the middle of both entrances and directly along the axis of symmetry, as seen in Figure I and had a usage rate of approximately 18%. Chiesa Santo Stefano, shown in Figure II has its panel facing the wall, tucked away from all entrances of the church. This church had a user percentage of about 6%.

**The fraction of visitors who interacted with the multisensory panels varied across the churches.** Across the nine installations 18% of visitors, on average, used the panels. Chiesa di San Rocco, where about 45% of visitors approached the panel, is believed to be an outlier due to its connection to the Scuola Grande di San Rocco. Due to this, we believe there was a bias in the church visitors as they were most likely seeking out information regarding the art and architecture of the space.

*Figure I: Visual showing the location of the multisensory panel within the Basilica Della Salute.*


*Figure II: Visual showing the location of the multisensory panel within Chiesa Santo Stefano.*

**The dirtiest panels were in the churches with the highest visitation.** Basilica di Santa Maria Della Salute was one of the dirtiest panels, as seen in Figure III. Installed in 2022, it received almost 2.5 times more visitors than the average of all nine churches which could explain how a newer panel seems more worn and dirtier compared to earlier ones.


*Figure III: Image that shows the wear and staining of the Basilica di Santa Maria Della Salute.*

**The panels are intended to be replaced every five years.** The panels were printed onto a sheet of PVC with a protective coating on top of the sheet. They are not meant to be permanent structures; on average, the panels should be replaced about every five years. Some of the panels were installed in 2019 or earlier, reaching the end of their expected five-year service life.

**The different lectern designs exhibit different structural performance.** Through observations we noticed three distinct design iterations of the lecterns which support the panels. The difference in the three designs can be seen in Figures Figure IV, Figure V, and Figure VI. The different structures exhibit differing stability based on light rocking tests, with Designs 1 and 2 performing significantly better than 3. Design 2's similarity to 3 shows that reinforcement can help to stabilize design 3.

*Figure IV: Image of design 1 with the aluminum joints.*

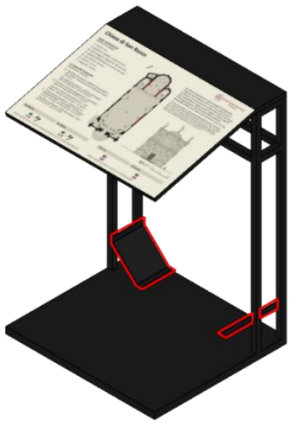

*Figure V: Image of design 2 with the more uniform joints and diagonal reinforcements to help stabilize the lectern.*

*Figure VI: Image of design 3 with uniform joints but no diagonal reinforcements.*

**The Lectern material is prone to rusting damage.** We learned through interviewing architect Leo De Carlo that the aluminum bars which comprise the structure were prone to rust in humid environments, and that a different material would be more suitable for the lectern such as plastic.

## Website Design

Tailored design features were an essential element to the website to accomplish the goal of accessibility for everyone. First, prototypes on different host sites were created to help us determine which would be the best host for the website. Through trial and error and input from SerenDPT, we determined that Google Sites would be the best platform to host the website, ensuring future maintenance and ease of replication. The website features a home page with general information on the CulturALL project, an individual page for each church that has an installed panel, an about CulturALL page, a get involved page, a donation page, and a contact us page.

# Recommendations and Conclusions

***We recommend that panels be placed in a prominent location within the church to maximize their usage.*** The importance of the panel location should be emphasized to churches that receive installations in the future. Panels should be placed along the church's axis of symmetry or the main path of circulation, always facing down the aisle toward the church.

***We recommend that the location of the multisensory panel within the church be labeled on the panel.*** This provision would allow a blind/visually impaired person to more effectively orient themselves within the space, even if the panel has to be placed in a less optimal location.

***We recommend a cleaning protocol be put in place to prolong the life of the installations.*** We advise the churches with panels to clean them at a minimum of once per day with spray on plastic cleaner and a soft cloth. To accomplish this, we stress that Rotary Club of Venice should get in touch with the janitorial staff of each church to inform them of the need to maintain these panels.

***We recommend the installations be reviewed for heavy maintenance or renewal every five years.*** Some signs of degradation, such as discoloration and worn-away embossing can be difficult to repair, so the installations may benefit from a full replacement.

***We recommend prolonging the life of the lectern structure in the short-term through cost-effective reinforcements.*** Two alternative designs have been created for consideration shown in Figure VII and Figure VIII, with alternative 2 suggested for further consideration. For more information on the two designs, Appendix G: Short-Term Lectern Reinforcement Suggestions, can be referenced.

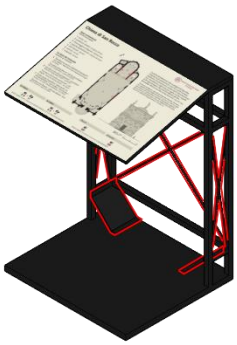

*Figure VII: Design 4 Alternative 1 using cross bracing with metal bars.*

*Figure VIII: Design 4 Alternative 2 using aluminum gussets at the corners for support.*

***We recommend replacing the lectern structures with a plastic-based design in the long term.*** The metal structure used for the multisensory panel lecterns is prone to rusting, creating a source of degradation. Designing a new lectern enables future panels to be larger and more robust, such

as the ones installed in Aquileia and Trieste. Furthermore, use of transparent plastic can align more strongly with the original vision of "invisibility" for the lectern, further highlighting the panel instead of the structure.

***We recommend that future CulturALL multisensory panel installations be documented on the database and website.*** Documenting each existing and new installation as soon as possible helps to make sure every installation is brought under the CulturALL network, lessening the need for work to be done later. This measure would maximize information accuracy by minimizing time between installation and recording of data, helping to streamline data consistency in the process.

***We recommend looking into making the panels printable in the future.*** Allowing users to print the tactile portion of the multisensory panels from home would enhance the utility of the website substantially. Lettura Agevolata has described Microcapsule printing as being a new and easier way to print from home, enabling those with an embossed printer to print the panel at home before visiting the churches.

***We recommend expanding upon the website.*** While robust, the site remains rather rudimentary. Moving to a different site host other than google sites long-term as the site's needs change would allow for more complex integration of other forms of technology, especially as CulturALL continues to grow.

***We recommend conducting a future study on the use of the panels by relocating a panel.*** Relocation of a multisensory panel from a poor location to a prominent one would provide important experimental data. We were unable to establish contact with a church due to time constraints of the church, however it should still be considered for the future.

CulturALL is a project full of potential. With the end goal of making art and culture accessible to all, the website is the first step into bigger and brighter opportunities to accomplish this goal. With modern technology expanding daily, these panels are just the beginning of what's possible for accessible interventions in the future.

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# 1. Introduction

Having universal access to sites of cultural heritage will benefit a country and the people that reside in it both socially and economically. Cultural heritage is an essential bridge to the past, allowing people to gain a greater understanding of different traditions and values. Access to sites of heritage allows individuals to learn about themselves or other cultures. Thus, benefiting society by bridging the gaps between people and unifying them under a mutual appreciation (Holtorf, 2011). Because culture is so intertwined with society, it's no surprise that exposure to it has been shown to be directly related to social achievement (Catterall et al., 2012). Furthermore, the EU argues that cultural heritage promotes sustainable tourism, which improves both employment and the revitalization of urban and rural areas (*Cultural Heritage | Culture and Creativity*, n.d.).

As important and beneficial as universal access to sites of cultural heritage is, many of these sites are not equipped to ensure an equally accessible experience for all. Most lack features such as ramps, audio guides, braille signage, etc. (Chiotis, 2023), which would benefit not only those with disabilities but also anyone looking to experience a site of cultural heritage. The absence of accessible features robs disabled individuals, who are equally entitled to these sites, of their right to experience culture. It does not, however, rob them of their desire to connect with culture; in fact, it strengthens it (Hayhoe, 2013).

Different accessible innovations have been created to help those with disabilities enjoy sites of cultural heritage making them available to all. One technology that assists in this effort is multisensory panels. The Rotary Club of Venice (RCV) started installing these panels in 2018 throughout prominent Venetian churches through their CulturALL initiative, each panel provides an embossed layout of both the floor plan and façade of the site. The panel also contains descriptions in written text and braille of the site's history and a list of must-see relics such as artworks, altars, sculptures, and shrines. For blind/visually impaired individuals, features on the panel help to orient themselves within the space and identify points of interest (Weimer, 2017). For deaf/hard-of-hearing individuals, descriptive videos containing captions or sign language translations can be accessed by scanning a QR code or using NFC technology. The videos not only help those that are hard-of-hearing; they provide audio descriptions which can aid those with visual impairments.

While RCV's CulturALL initiative has made improvements toward making sites of cultural heritage accessible to all, its multisensory panels, of which there are currently nine, still have limitations. In an ideal world, to truly make cultural heritage sites universally accessible, everyone should be able to learn and experience what these sites have to offer regardless of their geographic location. However, multisensory panels are restrained to their physical location. Furthermore, within Venice, little was known about how many users interacted with the panels and what their experience entailed. Knowing this information would provide the Rotary Club

with proper insight on how effective their program is, as well as how to improve future installations. A major concept of CulturALL is expansion; by having this data they can provide other organizations or rotary chapters with evidence that may inspire them to bring the initiative to their region.

The goal of this project was to further the CulturALL initiative of Venice's Rotary Club by recommending improvements for existing and future multisensory panel installations and providing greater access to the information on the panels present. We accomplished this by first evaluating the usage and condition of each panel. We then developed means for making the information on the panels widely accessible. Finally, we presented recommendations for future CulturALL panel installations and dissemination.

1. Evaluate panel usage and condition.
2. Develop means for making the information on the panels widely accessible.
3. Present recommendations for future CulturALL panel installations and dissemination.

# 2. Background

The chapter will begin by providing an understanding of the importance of cultural heritage. We then discuss tactile maps/panels and their limitations, means of accessibility for deaf/hard-of-hearing individuals, as well as technology for digital accessibility. Next, we introduce the CulturALL initiative of Rotary Club Venezia and look at the multisensory panels the club has been installing as part of the initiative. Finally, we examine an online resource which spreads information about the churches of Venice and ways it can be improved through accessibility initiatives.

## 2.1 The Importance of Cultural Heritage

Going to the art museum may be a challenging experience for those who are not fond of art, but for people with disabilities the challenge comes from the uphill battle they face trying to interact with art. In an article for the Harvard Educational Review Journal, Simon Hayhoe conducted interviews with blind and visually impaired (B/VI) visitors at the Metropolitan Museum of Art in New York. He argued that due to art's cultural symbolism (the interpretation of the work) visual art doesn't need to be seen in order to be understood by the visually impaired. Hayhoe furthers this point by emphasizing B/VI people's belonging in an art museum. In the majority of interviews he conducted, Hayhoe found that people who became impaired throughout their life only deepened their relationship as their vision changed (Hayhoe, 2013).

Having access to the arts, a large part of cultural heritage, is something that influences who a person becomes. According to a study published by the National Endowment for the Arts, students of lower socioeconomic standing (SES) who had little exposure to art throughout their adolescence were 18% more likely to not complete high school. Beyond their education, lower SES students with high art exposure were more likely to register to vote than a sample taken of all socioeconomic standings. Physical barriers limit who can have access to the arts and that directly impacts their ability to succeed. If exposure to art increased the success of those of a lower SES; it stands to reason that those with disabilities are faced with the same disadvantage limiting their ability to achieve in a non-disabled centric society (Catterall et al., 2012).

Sites of cultural heritage also help connect people of other cultures and promote economic growth. Throughout history cultural heritage has been used to create a sense of pride and nationality within cultures. However, today, sites of heritage are visited by a melting pot of cultures, allowing people from different backgrounds to experience and understand each other, in turn bringing their communities together (Holtorf, 2011). While not the main goal of these sites, the large influx of visitors results in a lot of tourism. This tourism brings in a source of revenue for many countries, especially those in Europe, a continent rich with prominent sites of heritage. The EU claims that using these sites to create sustainable tourism will not only increase revenue and create jobs, but strengthen the urban and suburban areas they reside in.

## 2.2. Making Culture Accessible

In this section, we review methods employed by museums and sites of heritage to make their content accessible to all. We begin with an overview of tactile maps, as well as how they are used and their limitations. We then discuss accessible accommodations for deaf/hard-of-hearing individuals, as well as their associated limitations and developments, before moving into recent developments to tactile maps and ending with an overview of digital accessibility.

### 2.2.1. Tactile Maps for the Blind and Visually Impaired

For blind/visually impaired (B/VI) individuals, navigation can be a challenge. However, it can be made easier through different uses of technology and accessible interventions. One useful tool which can aid a B/VI individual in the navigation of a space is a tactile map. Dating back to 1837, these maps have continued to be developed for nearly two centuries (Weimer, 2017). Often found in museums or other places of cultural significance, the maps can help B/VI individuals orient themselves within a space and locate points of interest using surfaces embossed with bumps and ridges, as seen in Figure 1. In many cases, tactile maps have integrated braille, enabling both pictures and text to be conveyed through them.

Tactile maps can be made using several methods. Stereo-copying uses heat-activated microcapsule paper, thermoform uses thermoplastic polymers, and screen-printing is done using wax paper. Each method has different traits, however maps using microcapsule paper are explored the fastest and users report a favorable experience with them (Papadopoulos, 2005). This paper is also used in the "Minolta" technique, which enables simple and quick tactile map production (*Microcapsule Paper – Easy Reading*, n.d.). Using this method, thermosensitive cells are deposited on the paper, after which point the paper is placed into an infrared oven, causing the cells to swell and create the tactile embossing. This method can sacrifice accuracy for printability, which can be done from home simply by acquiring an infrared oven (*Microcapsule Paper – Easy Reading*, n.d.)

Though they can provide benefits to their users, tactile maps suffer from inherent design drawbacks. The lower information density required to make symbols legible for B/VI people places a limit on the amount of information they can show (Wessel, n.d.). Furthermore, a lack of design standards poses restrictions to the potential of tactile maps. Specialized symbols that must be added when translating traditional maps to tactile make standardization a difficult challenge to overcome. The meaning of symbols often has cultural origins, thus countries may use different symbols, fonts, font sizes, or braille positioning to convey the same information. Such differences make tactile maps a less viable tool as a consistent, universally accessible solution. Furthermore, the time-consuming production process and cost of tactile maps causes these issues to be marginalized among experts, stymying research into rectifying this problem. Such issues in the lack of standardized tactile mapping leads to problems for B/VI individuals, such as these

tools being blocked from use in curricula for visually impaired students. Such a problem places a hindrance on their potential (Wabiński et al., 2022).

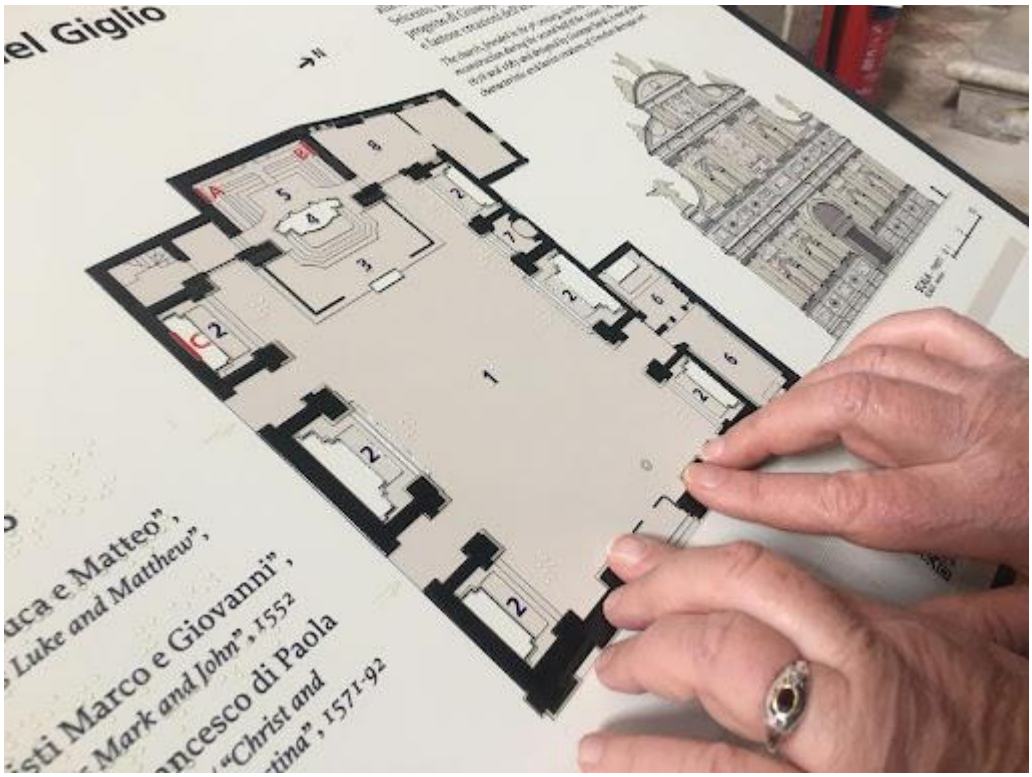



*Figure 1: A person using the tactile panel installation at Chiesa di Santa Maria del Giglio.*

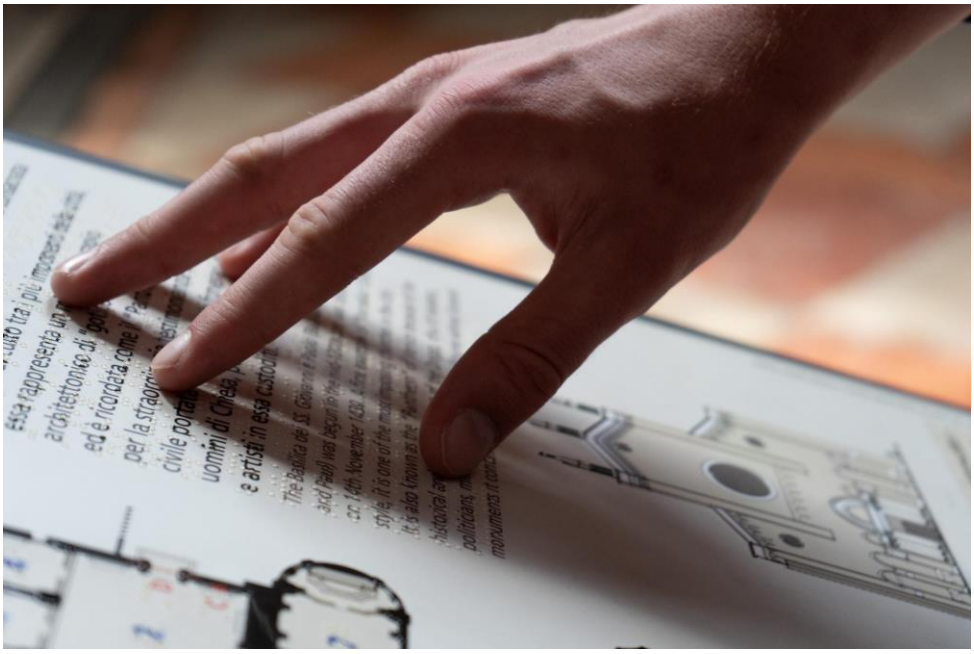


*Figure 2: A tactile map featuring braille text overlay.*

Though in early stages, research is being conducted across several areas to improve tactile maps. People are seeing tactile maps as a resource for accessibility, making them a hotbed for new research (Wabiński et al., 2022). New computer techniques for developing these maps have begun to enable the automatic generation of tactile maps and graphics (Wabiński et al., 2022), an improvement which makes converting hand-drawn maps to tactile maps more feasible. Such advancements continue to help B/VI individuals find their way through the world, as well as open the door for future research into the refinement of tactile maps. For instance, two studies which sought to tailor the designs of tactile maps based on the experiences of focus groups using them to navigate were conducted (van Altena et al., 2023). The focus groups, which comprised of B/VI people with varying levels of impairment, responded with varying degrees of success; many users found the overall complexity of the maps needed to be simplified, however the details helped significantly in highlighting points of interest and strengthening their mental picture of their environment. The researchers intend to continue iterating their designs with the ultimate goal of making tactile topographical maps more readily available on-demand, advancing toward a more accessible future (van Altena et al., 2023).

*Figure 3: Participants engaging in the study.*

Further research has been conducted regarding the application of tactile technology to digital environments, enhancing their capabilities in assisting with wayfinding–a term for general orienting and traveling from place to place. One study of eight B/VI participants tested a mobile app which used haptic smartphone features (features which engage the sense of touch) to replicate the wayfinding features of physical tactile maps (Giudice et al., 2020). Using the maps to become familiar with specific spaces, as well as waypoints within them, the participants were able to navigate the spaces with similar accuracy as if they had used physical tactile maps (Giudice et al., 2020). Due to the use of smartphone haptic technology in the experiment, this research could help further ease cost and production concerns for tactile experiences.

To assess a new means of production for tactile technology, researchers in the Czech Republic have conducted a study into the effectiveness of 3D-printed tactile maps, using participants from varying degrees of blindness, from congenital (present from birth) to acquired. Subjects were brought in to test out a sample print with several symbols and textures, from squares containing varying textures from rough to fine details, pictured in Figure 4. The study found that while certain elements, such as map keys and negative embossing (pressed into the sheet) needed refinement, other elements testing the roughness and color contrast for the visually impaired were satisfactory, signaling a potential future of 3D-printed tactile map production (Voženílek & Vondrakova, 2015).

*Figure 4: Example of the 3D-printed tactile test print in use.*

Similarly, researchers have been evaluating means of producing braille using 3D printing technology. A Shanghai experiment assessed the effectiveness of three 3D printing techniques: Fused Deposition Modeling (FDM), Digital Light Processing (DLP), and Polyjet. They found that FDM printed braille with too large an error variance with excessive roughness, while DLP printed with accuracy and smoothness. Polyjet achieved similar results to DLP, though at a higher cost–signaling that DLP is the most effective method of these three for printing braille (Li et al., 2022). In addition to allowing for the printing of braille from home, the study looked at the printers' effectiveness in printing a braille puzzle based on the characteristics of Chinese symbolic structure. The effectiveness of the printing allows this re-usable puzzle design to be used to teach braille writing, avoiding the defects of traditional handwritten braille in the process (Li et al., 2022).

### 2.2.2 Resources for the Deaf and Hard-of-Hearing

Establishing different methods that accommodate the deaf and hard-of-hearing community (DHH) are crucial. Guidelines from the Americans with Disabilities Act (ADA) suggest to integrate captions in order to make audio and video material more accessible (KC, 2022). While this can be effective, it is a common misconception that DHH individuals have no problem reading text online or large amounts of tightly packed text. DHH individuals may know verbal and written languages second to sign language and may not be as confident in their ability to read written words. In order to assist and accommodate them, text can be displayed in larger

sizes and arranged in a simple and straightforward manner taking into consideration that they "use their eyes to see and to hear" (Callender, 2015).

Similar to tactile maps for the B/VI community, difficulties arise when attempting to create a standardized experience for DHH individuals. Just like verbal languages, a variety of different sign languages exist to reflect the different cultures of their origins; according to National Geographic, there are over three hundred of them (*Sign Language*, n.d.). The dominant form of sign language is American Sign Language (ASL), and though its adoption is being promoted to the newer generation of DHH children (*What Is American Sign Language (ASL)?*, 2021), it is only used by a handful of countries outside of the USA, including the Philippines, Puerto Rico, Dominican Republic, Canada, Mexico, much of West Africa and parts of Southeast Asia (*Is ASL Universal?*, 2022). This makes ASL less reliable as a standard sign language compared with English, which is taught as part of a standard curriculum by 138 countries and is recognized as the official language of 67 countries and 27 non-sovereign entities (D, 2024). There have been attempts to create a more standardized sign language, however, the World Federation of the Deaf has expressed concern regarding this matter due to the omission of the natural variation of the different sign languages. This issue poses challenges, particularly to creating video caption experiences for DHH individuals who may not know any verbal languages.

It is possible to expand the utility of tactile maps to DHH people through QR codes and NFC technology. These technologies allow quick access to descriptions presented in other media formats such as videos in sign language. To further build on these forms of technology, QR codes are a specific organization of patterns that once scanned redirect the person scanning to an external website. Similarly, Near Field Communication (NFC) is a wireless connection that is automatically initiated when a smartphone or other capable device is held up to a NFC tag (*Near Field Communication (NFC) Overview | Connectivity*, 2024). This feature also takes the user to an external page on their device. This feature provides accessibility to people who have different sensory impairments including visual impairment, deafness, or hard-of-hearing. Such technology enables tactile maps to serve the D/HH community by providing QR-accessed videos with captions and sign-language translations.


*Figure 5a: On the image above a tactile map is being used by someone using the raised surfaces to feel the mapping*


*Figure 5b: Image of someone who has used the QR Code technology to watch a video of a person performing sign language for the information on the map.*

Recent advances in Artificial Intelligence (AI) technology have created new prospects for these enhancements. Some systems are able to use automatic speech recognition to translate live speech, perhaps for a talk or an internet video, with up to 98% accuracy by word error rate (WER) (Aregger, n.d.). These subtitles can then be machine-translated for viewing in other languages–with varying accuracy rates (Aregger, n.d.). An organization called Deaf AI seeks to take such features further, utilizing AI to adapt automatic speech recognition to create instant sign language translations across a variety of sign languages, displayed in the form of an avatar creating the hand signals (Masoumi, 2022), allowing DHH individuals with no spoken language knowledge to enjoy a broader range of content. These technologies are indicative of a development frontier ripe with progress to allow multisensory installations to reach a broader range of people.

### 2.2.3 Standardizing Accessibility on the Internet

Besides the physical, online accessibility is a major challenge many groups are trying to overcome. Technology is constantly changing, as new innovations diversify the need for universal standards for remaining as accessible as possible becomes more prominent. Many guidelines by both the Americans with Disabilities Act (ADA) and the Web Accessibility Initiative have been made in order to guide web developers on how to make websites more accessible to people with disabilities. These guidelines address issues such as: images without text equivalents, specifying colors, font sizes, and documents not posted in accessible formats (*ADA Tool Kit: Website Accessibility Under Title II of the ADA*, n.d.). The Web Accessibility Initiatives provide solutions to the aforementioned design issues, as well as four core principles to follow while making a website: perceivability, operability, understandability, and robustness.

Each of which can be tested using the initiative's own conformance test (*Web Content Accessibility Guidelines (WCAG) 2.1*, n.d.).

## 2.3 Expanding Access to Venetian Cultural Heritage

In this chapter, we introduce the CulturALL initiative, from its origins to its present work. We then look at CulturALL's multisensory panels and their features. Finally, we discuss online resources that already exist about the churches of Venice.

### 2.3.1 The CulturALL Initiative

The Rotary Club of Venice (RCV) has held a strong presence in the city of Venice, Italy since 1924. The club's goal is to "provide service to others, promote integrity, and advance world understanding, goodwill, and peace through their fellowship of business, professionalism, and community leaders." One of RCV's latest projects in Venice, CulturALL, has implemented multisensory panels in churches throughout the city to make appreciating cultural heritage easier through accessible interventions, with ambitions to bring more to the city and beyond.

Venice is a suitable place for this project, being an iconic tourist destination that is home to many historic churches and art collections. Across the city, there are approximately 139 churches. About 88 of these remain as operating churches with consistent services, while the others have been converted into places such as museums, schools, and shops (McCaffrey-Guerrera, 2018). These churches house many historical pieces of artwork created by famous Italian artists. Both the churches and artwork tell a story and show the history and culture of the city of Venice over its centuries of existence. The CulturALL initiative was born out of a desire to bring the art and culture these churches have to offer to all.

Stemming from a collaboration between Elisabetta Fabbri, then-president of RCV and Lucia Baracco of Lettura Agevolata, CulturALL was conceived as the Visual/Tactile Maps project in 2018, on the 500th anniversary of the birth of the artist Tintoretto, whose works feature in some of Venice's churches. After beginning with the installation in Santuario di Lucia, the sanctuary of the patron saint of the blind, four churches which house Tintoretto paintings received the next set of installations: Chiesa di San Rocco, Santo Stefano, Santa Maria del Giglio, and San Moise, (*The Churches of Venice - Lettura Agevolata*, n.d.). The project grew to more churches from there and was given the CulturALL name when its scope was expanded to encompass Italy and beyond, with multisensory panel installations present in Aquileia, Bari, Castelfranco, Palermo,

Trieste and more. Four more installations are planned within Venice, and the project aspires to spread to Rotary Clubs across the world.

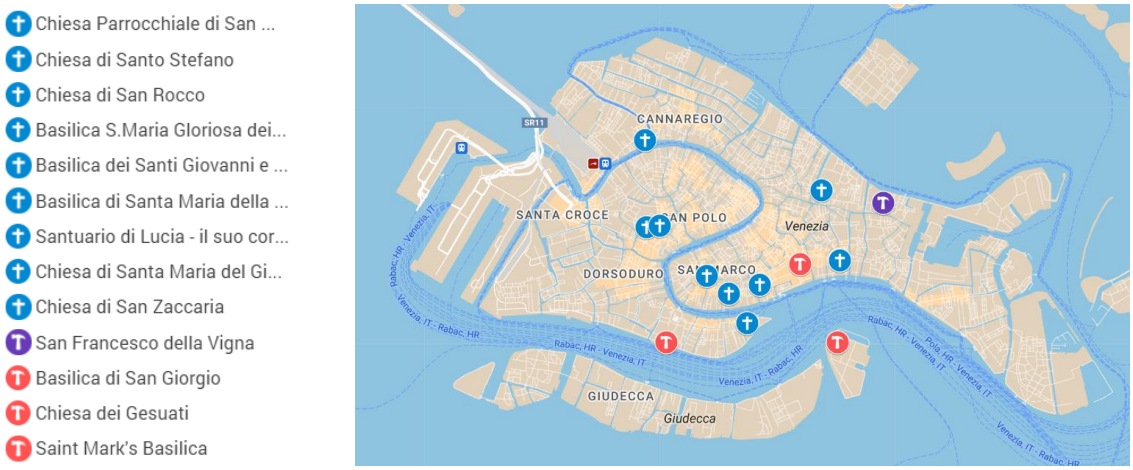



*Figure 6: Map of present and planned CulturALL multisensory panel installations in Venice as of April 2024.*

## 2.3.2 CulturALL Multisensory Panels

The implementation of multisensory panels serves as a foundational element of the CulturALL project. The goal of the project is to “make art and culture accessible in unconventional ways" (Rotary Club Venezia, n.d.). The project aims to deliver this goal primarily through informational panels featuring tactile maps, audio content, video content, and virtual reality content. It aims to apply these strategies to a host of structures, from museums, places of worship, and theaters to cities and historical centers (Rotary Club Venezia, n.d.). Across Italy, twenty multisensory panels related to CulturALL have been installed in several types of buildings. Venice has been the primary recipient of these panels, with nine installations as of 2023 across its network of churches (Rotary Club Venezia, n.d.). Four more panels were expected as of 2024. An official list of the installations across Italy as of 2024 can be found in Figure 7.

As seen in Figure 8, the multisensory panels display the building or church they reside in. Normally the mapping is displayed in a two-dimensional layout of the building; the outlines of the walls and rooms have embossed contours so that B/VI persons have the ability to feel the mapping and get an idea for the architecture and layout of the building. On most maps there are braille descriptions for B/VI people to learn about the history of each church or religious building. The multisensory panels contain Quick Response (QR) codes or Near Field Communication (NFC) technology, with some panels using them to convey the history of the church, others the details of the art, and some have both, The features vary for each map, but some QR codes link to a video of a professional sign language interpreter providing a visual explanation for those who are DHH, or they may only contain audio descriptions with captions

so that people can listen or read about the building (Rotary Club Venezia, n.d.). The simple layout, concise descriptions, and QR accessibility make these panels sources of centralized information for all visitors, B/VI, D/HH or otherwise. Per documentation from the Rotary Club of Venice and as shown in Figure 7, the average delivery time for a multisensory panel is about 2 months and the cost to make each multisensory panel is approximately 5,000 euros (Rotary Club Venezia, n.d.).


*Figure 7: Official list of planned and present multisensory panel installations (Rotary Club Venezia, 2023)*

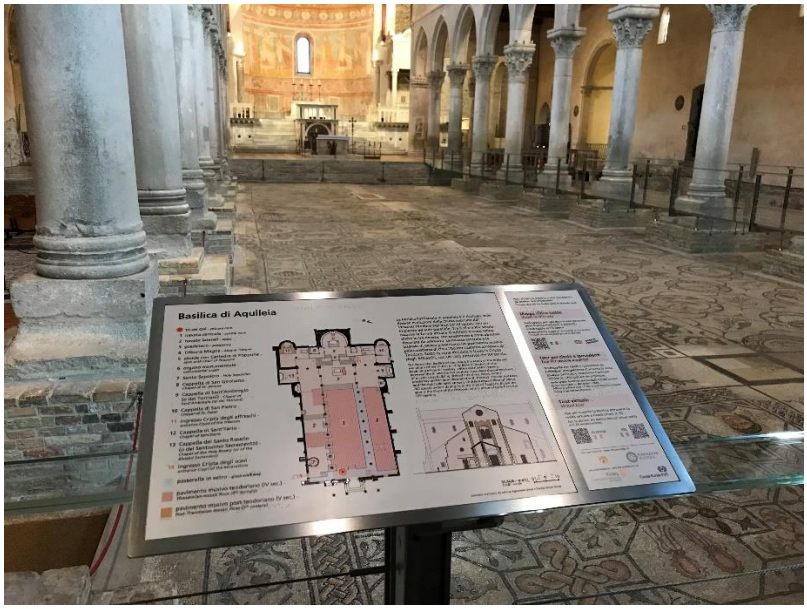



*Figure 8: An example of a Multisensory Map in the Basilica di Aquileia in Aquileia, Italy.*

The panels were designed for a service life of five years before needing to be replaced, according to Lettura Agevolata, signaling that the oldest maps are approaching the end of their initial lifespan. The lecterns on which the maps are placed, pictured below in Figure 9, do not have the same service life restriction. According to their architect, Leonardo De Carlo, their design, intended to be "invisible" to place emphasis on the map, faces known structural problems. A protocol and transcript of the interview with Signor De Carlo can be found in Appendix F: Interview with Leonardo De Carlo.

*Figure 9: Full Multisensory Panel Installation in Chiesa di San Rocco, Venezia.*

### 2.3.3 Spreading Knowledge of the Churches in Venice Online

Churchesofvenice.com, an online repository, boasts an extensive knowledge bank of information about Venice's churches. The database was put together by one man named Jeff Cotton, who labels himself as a creator, photographer, and writer. The website was created in order to address the lack of compiled information in a single destination about Venice churches. All research and information are curated by Cotton, who provides valuable and reliable citations throughout the website. For almost every church there are multiple sections documented: history, interior, art,

hours of operation, and more. Along with textual information, Cotton provides images of the building, the art, and even maps (Cotton, 2024). Such detailed documentation emulates part of CulturALL's vision by spreading the information and art, thus the culture, to a broader audience.

In terms of a source that gives accessibility to all, especially for those who are visually impaired, or hard-of-hearing, more work is needed. Cotton states he created the resource with the intention of establishing a place where information about each of the churches of Venice can be found in one place (Cotton, 2024). But those who have disabilities may find it hard to use this source, due to the small font and choice of colors that have little contrast to the color of the text. The guidelines put out by the ADA on web design, as mentioned in 2.2.2 Resources for the Deaf and Hard-of-Hearing, state several simple suggestions to keep in mind when making a website to ensure it is accessible to all. Some important elements that are listed include specifying colors and font sizes, including videos with accessible options, and text equivalents for images (*ADA Tool Kit: Website Accessibility Under Title II of the ADA*, n.d.). Using these guidelines, along with the information already available online, it is possible for a website documenting these churches to align more accurately with the CulturALL vision of accessibility for all.

# 3. Methodology

The goal of this project was to further the CulturALL initiative of Venice's Rotary Club by recommending improvements to the existing and future multisensory panel installations and providing greater access to the information on the panels present. We sought to achieve this goal by evaluating panel usage and condition, developing means for making the information on the panels widely accessible, and presenting recommendations for future CulturALL panel installations and dissemination. We accomplished these objectives through the following methods:

1. Collecting information about panel content, usage, and condition through physical observations

2. Developing a website which is accessible by all that presents and promotes CulturALL, incorporating principles of accessibility, ease-of-use and maintainability.

3. Recommending improvements to the CulturALL panel installation program based on the information we collected about the panels.

In this chapter we provide a description of the observation procedures for the collection of data regarding the usage and conditions of the panels. Then we detail the design process for the website which contains all the panel information. The process is laid out through prototype sketches, design criteria to promote accessibility, and more further decision processes.

## 3.1 Collecting Information on the Rotary Club of Venice's Multisensory Installations

In this section, we describe how we collected information regarding the content, usage, and condition of the multisensory panels installed in the churches of Venice. Having this information would allow future improvements to the panels to be streamlined both with a central base for all information as well as the additional information we sought to provide. With the information, we sought to answer the research questions below:

1. What fraction of visitors to each installation interact with the panels?

2. Of the fraction that do interact, what length of time do they spend there and what features do they use?

3. How does the placement of the panel seem to impact usage?

4. What is the current condition of the installations?

This section will first discuss the data we chose to collect. Then we follow with a more in-depth explanation of the observations and inspections of the multisensory panels through visitations.

### 3.1.1 Visiting the Multisensory Installations

Our first step was to visit each of the nine multisensory panel installations. During these visits, we collected the following data:

1. **Photographs of the churches:** Using a mirrorless camera, we took photos of the interiors and exterior façade of the churches trying to capture as much detail as possible.

2. **Number of steps to access church:** We counted the steps required to enter the church, looking for any accessible accommodations such as ramps.

3. **Photographs of the multisensory installations:** We took photos of each installation in order to document the details of each map, text on the panels, panel contributors, lectern structure, and its placement within the church.

A more detailed protocol can be found in Appendices A.

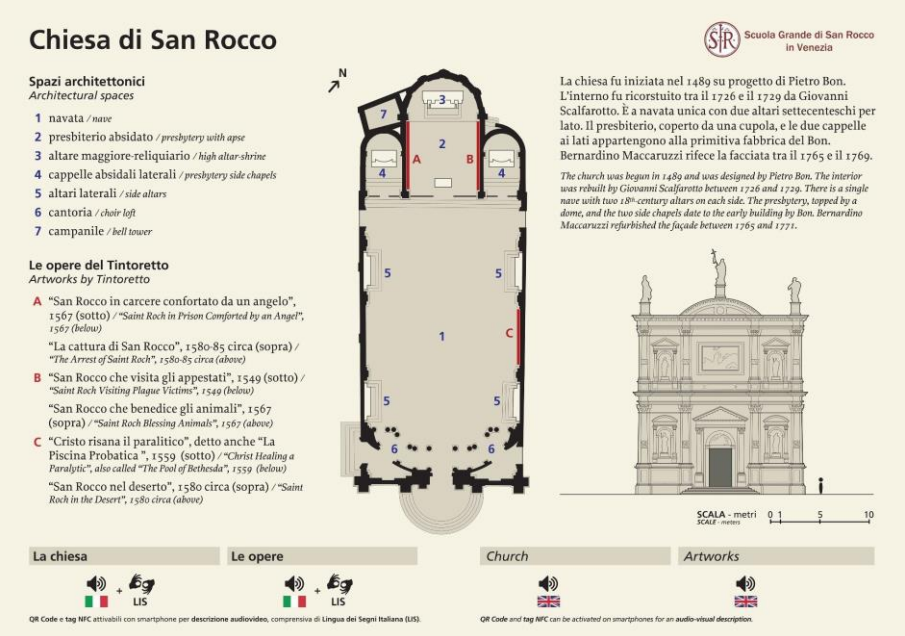



*Figure 10: Photograph of the multisensory panel at Chiesa di San Rocco.*

### 3.1.2 Observing the Use of the Panels

In order to understand how many users interact with the multisensory panels, as well as the nature of those interactions, we made visits to assess them. This was done through two one-hour periods at each installation, all completed on weekdays split into two time periods: one in the morning and the other in the afternoon. The major types of data we collected were:

- **Visitor Numbers:** We counted the total number of visitors to the church as well as the number of visitors who interacted with the panels.
- **User Interactions:** We timed the length of each interaction as well as what features users interacted with such as feeling the embossed designs or scanning a QR code.
- **User Demographics:** For each user we estimated their gender, age, and whether any kind of disability was physically evident.

More information about the specific visitation protocol can be found in

Appendix A: Observation Protocols

### 3.1.3 Inspecting the State of the Installations

As part of the observation protocol, we conducted an inspection of the physical state of each multi-sensory installation. We examined the following elements:

- **Endurance of the adhesive:** The corners and sides of each panel and plastic coverings of the collaborators/donors' logos were checked to see if they had begun to peel off the lectern.

- **Maintenance of the panel**: We took note of any buildup of grime, degradation of panel elements, or any scratches/marks.
- **Structural integrity of the lectern:** The structure was rocked back and forth, left to right, and in a twisting manner to see how it responded. Photos of each structure were also taken for the sake of comparing lectern models and their integrity.

More information about the visitation protocol can be found in

Appendix A: Observation Protocols

## 3.2 Website Design and Implementation

This section describes the process of designing and implementing the CulturALL website. Our research implied that very few attempts have been made to translate the information displayed on a multisensory panel to a digital format, stressing the need for a thought-out design process. We also needed to make sure the website could inspire and help other organizations to expand CulturALL to their own location. Furthermore, we needed to include an element to engage the general public with CulturALL to inspire donations to fund new installations.

In this section we describe how we collected and cataloged the information from the installations. Then we discuss some of the design criteria and features made from these conditions to conceptualize a vision of what the website could look. Finally, we describe our efforts to achieve a replicable and maintainable website.

### 3.2.1 Gathering Source Data of the Multisensory Panels

To build the website, we sought to collect the data encoded on the panels. Such data includes:

- **Downloadable Files of the Panels:** Due to the specialization of the machines used by Lettura Agevolata, the company responsible for the creation of the panels, we were only able to provide .jpeg files of the panels on the website which cannot be easily converted to physical embossments on their own.
- **Audio-Visual Content:** All panels contain two or four videos which contain descriptions of either the church, art, or history in Italian, Italian Sign, English, or International Sign. Each installation's videos were cataloged and contain helpful titles which indicate the topic and language. Note that not all panels contain all four translations or all three description topics.

To achieve this, we first established contact with Lettura Agevolata to gauge their interest in sharing their files with us. In the process, we were able to clarify the vision for enabling the personal printing of the tactile panels, discuss terms and feasibility of hosting the tactile panels on the website, as well as make them downloadable to the public. We learned that while technology exists to make printing of tactile maps easier, such as microcapsule printing, the maps in Venice do not support it. With Lettura Agevolata's cooperation we were able to provide the downloadable .jpg files straight from the website. The videos with sign language translations describing the churches can be accessed directly from the panel through QR/NFC technology. By scanning each QR code we were able to gather all of the video links, with each one being available directly from the website.

### 3.2.2 Identifying Key Features to Enhance Ease of Use for All

Our aim was to create a website that is above all else well-organized and easy to use. This applies to both users with impairments as well as those without. We sought to achieve this by analyzing the two sources identified in 2.2.2 Resources for the Deaf and Hard-of-Hearing(ADA, WAI), identifying key accessibility criteria as listed below:

- **Alt-text**: Added *alt text* to all non-text content. Alt text are brief hidden descriptions that are added to images which allow screen-readers to describe what the image is displaying for those who are visually impaired.
- **Color Contrast:** Kept the contrast ratio between text and background colors at a minimum of 10.32:1 which is above the criteria of 4.5:1 and 7:1.
- **Consistency:** Designed page layouts, title, headings and body text fonts and color, and other features throughout the website as uniform as possible.

A full list of criteria can be found in Appendix E: Accessible Website Design Criteria.

We worked to meet these criteria by including features to address the needs of people with visual impairments or hard-of-hearing. Specific features and design principles implemented include: text-to-speech, readability of text, font, type size, and contrast of colors. As mentioned previously We sought to minimize the time required to navigate through different pages, allowing users to find information efficiently. Such provisions serve both the needs of users with disabilities and those without by keeping the website experience as simple as possible.

### 3.2.3 Designing with the Intent to Inspire

One of RCV's greatest aspirations for this project is to inspire other Rotary Clubs around the world to implement CulturALL in their own region. Toward that end, we designed the website to properly showcase the CulturALL mission, work done so far, and provide information about how someone could expand the project to their own area. The goal to inspire informed a design objective of simplicity, as the aesthetic simplicity helps to prevent CulturALL from appearing too complicated of a task. We felt that sacrificing complexity and sophisticated aesthetics was a worthwhile tradeoff to meet the goals of the website, so that its features and information can be conveyed through a simple yet impactful design.

### 3.2.4 Identifying Suitable Site Host

Finding a suitable site host, a service to put the website on the internet to match the needs of the project, required considerations from several areas. With the end goal of keeping information and navigation simple, we needed a host that could ensure ease of use for users. Furthermore, we wanted to make sure the website might be maintained in the future, so we worked with SerenDPT, a Venice-based company that would maintain the site for RCV, and for them we needed to find a host that made maintenance of the site easy.

Different platforms offer different benefits, so we carefully compared and contrasted the different elements from several alternatives. One option we considered was Google Sites, which we found to be a good candidate for ease of access and user navigation. Google Sites is free and can be easily replicated/modified, allowing virtually anyone to use it regardless of their technical experience. Additionally, Google Sites offers a mobile friendly option to access websites on mobile devices. Another option was Wix, which has similar benefits to Google Sites in that it is easy to learn, replicable, and free. One major advantage that stood out to us about Wix was that it allowed us to make the website more customizable, whereas Google Sites lacked some of the same flexibility to code unique modules into the website, as well as embedding images with links to make them interactive. Ultimately, the needs of SerenDPT, which emphasized simplicity, uniformity for website building, and commonality with their existing digital infrastructure led us to choose Google Sites.

## 3.3: Developing Guidance for the Improvement of Present and Future Multisensory Panel Installations

In this section, we describe how the data from observing the panels was analyzed and grouped to develop recommendations for improvements to present and future multisensory panel installation. We also discuss how our visits to installations in Aquileia, Italy, and meeting with architect Leonardo De Carlo helped to guide our analysis and recommendations.

We examined the percentages of panel usage in each church and compared them with observations about the locations of the panels within the churches. We were particularly interested in how the different locations of panels within their respective spaces might impact use, from more prominently located panels such as Basilica Dei Frari, to less prominent panels such as in Chiesa di Santo Stefano. For the cleanliness of the panel, we looked at correlations between use and physical state to determine whether a relationship between higher user counts and greater wear on the panel surface existed. Finally, we sorted the different panels by lectern structure model and used this data as a basis for which to compare the sway–the motion of rocking back and forth or side to side– data we obtained from each installation, looking to see if any of the models were particularly vulnerable to sway.

After completing the observations in Venice, we traveled to Aquileia, an ancient city in Northeastern Italy dating back to the Roman era, to learn about the three multisensory panel installations completed by its Rotary Club. We met with a representative of the Rotary Club of Aquileia, Raffaele Caltabiano, who showed us around the installations at the Basilica di Aquileia, Cimitero degli Eroi di Aquileia, and Il Museo Archeologico. We sought to learn how a different Rotary Club had adapted the CulturALL program to its chosen sites of heritage, deepening our understanding of the project as a whole. The ultimate goal from this visit was to be able to use what we learned to inform recommendations for the multisensory panels in Venice.

While analyzing the data on the lectern structures of the multisensory panels, we met with Leonardo De Carlo, the architect who designed the lectern structure used by the Rotary Club of Venice to support the multisensory panels. By meeting with the designer of the lecterns, we sought to learn more about the design intent, material choice, and reflections on the design process–particularly whether Leonardo De Carlo had any changes he would make to the design if given the opportunity. The primary goal from this meeting was to use what we could learn about the panels to better analyze any correlations we notice in the data, as well as to help decide which types of recommendations to make based on the data.

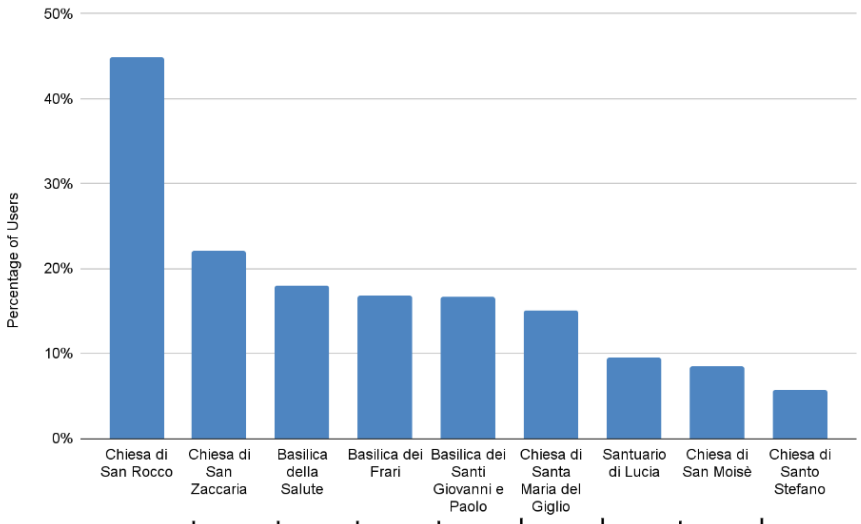
# 4. Multisensory Panel Placement, Condition, and Usage

In this chapter, we review results from the observations within the nine churches containing multisensory panel installations in Venice. We first examine how the location of a panel within the church may have an effect on its use. Next, we assess the cleanliness of each panel, rating them on a scale of poor, fair, or good, and considering factors that may contribute to the conditions of each state. Finally, we look at the structure of each panel's lectern, noting the designs and evaluating the stability of each. These findings provide a general overview of the multisensory panels in Venice and serve as the foundation for recommendations we will provide to RCV for further expansion of CulturALL.

## 4.1 Non-uniform Panel Usage Across Churches

**Our observations suggest that the panels oriented facing inward toward the church, along the axis of symmetry, and in sight once entering the church, were easily noticed and had the highest user interaction.** The Basilica Della Salute, one of Venice's most famous churches, presents its panel to the viewer right as they walk in from both entrances, as seen in Figure 12. This installation had one of the highest usage rates with a percentage of approximately 18%. Chiesa Santo Stefano, shown in Figure 13 has its panel facing the wall, tucked away from all entrances of the church. This church had a user percentage of about 6%. This data supports an observation by Lucia Baracco of Lettura Agevolata, who stated that the installation at the less-optimal location in Santo Stefano would result in diminished usage.

**The fraction of visitors who interacted with the multisensory panels varied across the churches.** Figure 11 shows the proportion of visitors who approached the panel in each church we observed. We found that across the nine installations 18% of visitors used the panels. However, there was significant variation amongst the installations. Chiesa di San Rocco, where about 45% of visitors approached the panel, is believed to be an outlier due to its connection to the Scuola Grande di San Rocco which is a very famous collection of art within Venice. Due to this, we believe there was a bias in the visitors who came to the church as they were most likely a more artistically knowledgeable demographic and therefore were more likely to seek out information regarding the art and architecture of the space.




| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Number of Users: | 13 | 82 | 95 | 40 | 17 | 6 | 12 | 37 | 7 |
| Total Visitors: | 29 | 371 | 528 | 243 | 102 | 40 | 127 | 432 | 123 |

*Figure 11: Graph of the percentage of visitors who interacted with the panel for each church, ranked from most to least, followed by a correlating table showing the total number of users and visitors.*

*Figure 12: Visual of the location of the multisensory panel within the Basilica Della Salute*


*Figure 13: Visual of the location of the multisensory panel within Chiesa Santo Stefano.*

**Many, but not all, of the multisensory panels are positioned on or near the axis of symmetry within a church.** Most churches have a symmetrical layout with pews and typically the same layout on either side as seen in Figure 14 within the Basilica Dei Frari. This more central location draws in the eyes of individuals who are looking around the church, as intended, to then interact with the panel. Basilica dei Frari, for instance, was designed in the Gothic style of architecture (*Esterno*, n.d.), a style commonly observed among churches. Historically, the axis of symmetry has been intended to represent a path: the early pilgrimage as one makes his way toward the Kingdom of God (*Symmetry in Architecture by Kim Williams, Architect*, n.d.). Such a concept expressing the Christian ideal took hold from 300 to 1300 AD, and as such became influential in church design becoming synonymous with church architecture.

*Figure 14: The panel centered and meeting symmetry within the Basilica dei Frari.*

**Some churches face limitations as to where they can place their panels.** For example, Chiesa di San Rocco, as seen in Figure 15, has a narrow nave along the axis of symmetry. A panel in such a central location might make navigating the center of the church difficult, especially for someone who relies on a wheelchair. Experimenting with the panel locations could provide further insight into how location affects usage.

*Figure 15: The panel off to the side within Chiesa di San Rocco.*

## 4.2 Physical State of the Panels

**The nine multisensory panels were in markedly different states of repair.** We observed scratches, stains, discoloration, worn-away stickers, and weak adhesion. Interestingly, some panels that were more recently installed, such as Chiesa di San Zaccaria (2023) and Basilica della Salute (2022) are among the dirtiest and most worn-down installations.

**The dirtiest panels were in the churches with the highest visitation.** Basilica di Santa Maria della Salute was one of the dirtiest panels as can be seen in Figure 16. Salute receives almost 2.5 times more visitors than the average of all nine churches with panels. With so much visitation and a favorable location, this most likely leads to more usage of the panel. Salute also receives almost 2.8 times more map users than the average of all nine churches with panels. This could explain why even though it is a newer panel, it is more worn out and stained than the others.

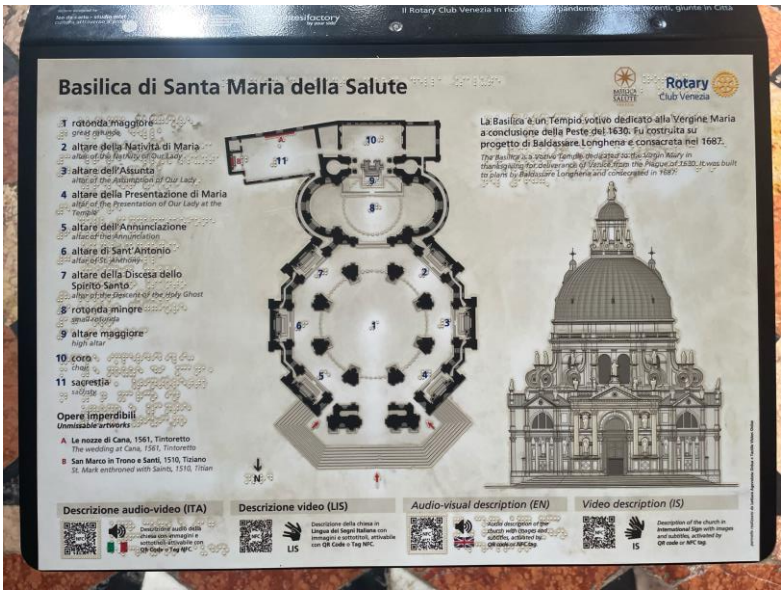



*Figure 16: Image that shows the wear and staining of the Basilica di Santa Maria della Salute.*

**The adhesion joining the the PVC panel sheet to the metal lectern is beginning to weaken.** As exemplified in Figure 17, the corners of most panels were peeling off the stand, showing that the adhesive used was beginning to wear. For a complete analysis of the condition of each panel, Table 1 can be seen below.

*Figure 17: The image above shows the corner of the panel in Chiesa di Santa Maria del Giglio being easily lifted and the adhesive not doing its job.*

**Table 1: Ratings of the physical state of each panel based on the observations.**

| **CHURCH** | **RATING OF CONDITION** | **NOTES** |
|---|---|---|
| Basilica dei Frari | **good** | Clean overall, with a little bit of discoloration near the titles for the audio-visual descriptions. The adhesion is very weak at the bottom left corner. According to RCV, the panel has been cleaned. |

| | | |
|---|---|---|
| Basilica dei Santi Giovanni e Paolo | **good** | Decent cleanliness, with some discoloration and black marks. Bottom corners of the adhesion is weak. Plastic covering contributors and donors is coming off, being held down by scotch tape. |
| Chiesa di Santa Maria del Giglio | **fair** | Minor Discoloration. Adhesion was weak on some corners. |
| Chiesa di San Rocco | **good** | Discoloration, minor scratches. Adhesion is in fairly good condition. |
| Santuario di Lucia | **fair** | Discoloration, buildup of grime around braille features. Bottom right corner of panel has weak adhesion. |
| Chiesa di Santo Stefano | **fair** | Discoloration noted across panel, as well as several marks and stains. Adhesion is in good condition. |
| Chiesa di San Moisè | **poor** | Discoloration, significant scratches. Adhesion is in decent condition. |
| Chiesa di San Zaccaria | **poor** | Significant discoloration and scratches. Braille appears very worn. Plastic coating around sponsors has some rips and bubbles. Adhesive is weak at the bottom left corner. |
| Basilica della Salute | **poor** | Significant discoloration, especially around braille features. Scratches, chipped embossing are present. |

| | | |
|---|---|---|
| | | Adhesion on top left corner is weak. |

**The panels are intended to be replaced every five years.** Members of Lettura Agevolata and Tactile Vision Onlus provided insightful information about the origins of the installations. The panels were printed onto a sheet of PVC with a protective coating on top of the sheet. They are not meant to be permanent structures and wear over time through the amount of usage. Both organizations suggested on average that these panels should be replaced about every five years. This would explain why some of these panels are in their current state. Specifically, the panels in the churches of Santuario di Lucia, Chiesa di Santo Stefano, Chiesa di Santa Maria del Giglio, Chiesa di San Moise, and Chiesa di San Rocco, were installed in 2019 or earlier, reaching the end of their expected five-year service life.

**In Aquileia, each panel design was unique to its environment compared with the relative consistency seen across Venice.** The designs of the panels have the common feature of being split into two parts, with the QR codes on a separate board in case they need to be updated. Raffaele informed us this design was adopted by the Rotary Club of Trieste, Italy for its multisensory panels. Rather than only being in churches, Aquileia had multisensory panels in a museum and an outdoor installation in a cemetery. In the church, Basilica di Aquileia, the panel was mounted directly on a metal barrier. In the cemetery, Cimitero degli Eroi di Aquileia, the panel was mounted on a heavy-duty metal structure, and in the museum, Il Museo Archeologico, the panel was wall mounted. We spent the most time around the Basilica di Aquileia, which we observed to be remarkably clean considering its age dating back to 2018, the same as the oldest installations in Venice. We learned the church wipes down the panel hourly for disinfection, which helped us get a sense of how these panels can be maintained.

## 4.3 Multiple Structure Designs of the Lectern

The general structure of all models consists of four supporting bars attached to a base, all composed of aluminum. One set of horizontal bars connects the top of the pillars, and another is set slightly below to provide reinforcement. The contributor plate is set horizontally on the top set of bars, and the metal sheet on which the panel is placed extends outward toward the viewer from this plate at a slight angle. The designs differ primarily at their connection joints, where the vertical bars meet the horizontal ones, as well as at the base.

**The different lectern designs exhibit different structural performance.** Since the first installations of Venice's multisensory panels back in 2018 there have been three design iterations of the lectern that the panels are mounted to. Structural performance varies considerably between some of the models. This variation may be due to some of the structural differences between

models. According to the architect behind the panels, Leonardo De Carlo, design modifications were caused by material changes made by the factory which produced the lecterns. These changes have led to newer lecterns which, in some cases, perform less optimally than older ones. In this section, we will go into more detail on the three iterations.

**The original lectern design, found in the first five panel installations, is the most structurally sound design without reinforcement.** In Design 1, the main structure of the lectern is connected with aluminum joints as shown in Figure 18: Image of Design 1 with the aluminum joints. Through careful testing, this design was found to be the strongest, with lecterns using this structure able to resist sway without reinforcement. The only exception was in Chiesa di San Rocco, in which the aluminum joints sometimes failed to hold the bars and would pop out.

*Figure 18: Image of Design 1 with the aluminum joints.*

**The most recent lectern design suffers from considerable sway.** In Design 3, the main structure of the lectern has the same uniformly connected metal joints as Design 2, except without the diagonal reinforcements as shown in Figure . This design performed the worst of the three, with significant sway observed across all lecterns using this structure. Across all designs, sturdy or otherwise, the base was found to have warped to a slight upward curve, resulting in forward and backward sway.

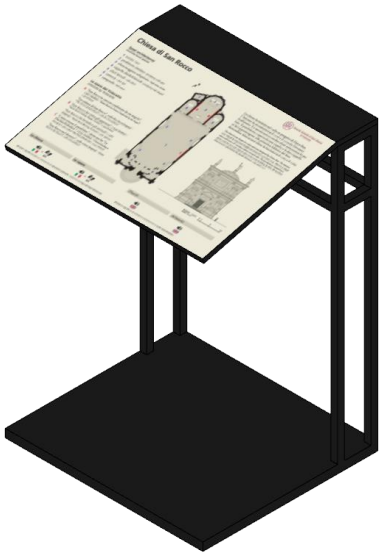


*Figure 19: Image of Design 3 with uniform joints but no diagonal reinforcements.*

**Diagonal reinforcement can help to stabilize the lectern.** In Design 2, the main structure of the lectern has more uniformly connected metal joints as shown in Figure , similar to design 3. As mentioned, the joints differ from Design 1 due to a material change by the production factory, and this weakens the join connections. This design, however, performed the best during structural testing, with the diagonal reinforcement helping to offset sway and the wheels beneath the base helping to absorb some of the force on the lectern. The result implies that the shortfalls from the most recent designs can be rectified with reinforcement.

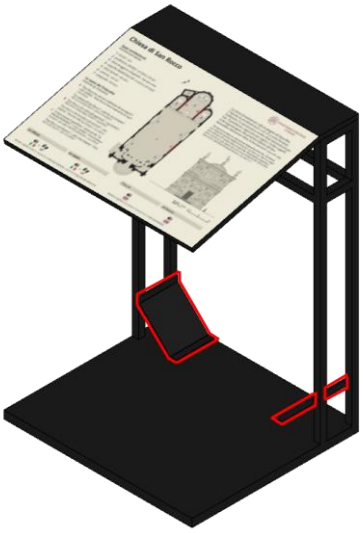


*Figure 20: Image of Design 2 with the more uniform joints and diagonal reinforcements to help stabilize the lectern.*

**The Lectern material is prone to rusting damage.** Our meeting with Leonardo De Carlo gave us considerable insight into the design of the lecterns. One notable takeaway was the iterative design process behind the lectern, which involved building a model of it to test before making changes, which revealed the initial effectiveness of the chrome-plated industrial joints in design 1. We learned that structural issues were known, and the issues observed with newer joints may be related to a material change by the lectern manufacturer. A new revelation was that the aluminum bars which comprise the structure were prone to rust in humid environments, and that if he could change the design, Leonardo would choose a different material, such as plastic, to comprise the lectern.

A full summary of the meeting with Signor De Carlo can be found in Appendix F: Interview with Leonardo De Carlo.

**Table 2: List of Lectern models as well as their current physical state for each church.**

| **Church** | **Structural Design** | **Current State of the Structure** |
|---|---|---|
| Chiesa di San Rocco | Model 1 | - No wheels<br>- Considerable Sway/Pops out of socket |
| Santuario di Lucia | Model 1 | - No wheels<br>- Minimal Sway |
| Chiesa di Santa Maria del Giglio | Model 1 | - Sturdy<br>- Minimal Sway |
| Chiesa di Santo Stefano | Model 1 | - No wheels<br>- Minimal Sway |
| Chiesa di San Moisè | Model 1 | - No wheels<br>- Minimal Sway |
| Basilica dei Frari | Model 2 | - Wheels present<br>- Minimal Sway |
| Basilica dei Santi Giovanni e | Model 3 | - No wheels |

| | | |
|---|---|---|
| Paolo | | - Considerable sway |
| Chiesa di San Zaccaria | Model 3 | - No wheels<br>- Considerable sway |
| Basilica della Salute | Model 3 | - No wheels<br>- Noticeable sway |

# 5. Providing Digital Access: A Website for CulturALL

In this chapter, we will discuss the implementation of the website using the design criteria discussed in Chapter 3. We discuss how the information displayed on the website was obtained and the ways it can be accessed. Finally, we go over the final design choices made to include different accessibility features we implemented to improve user experience and make the website accessible to all.

Taking into consideration the limitations of Google Sites and our own regulation-guided criteria which can be found in Appendix E: Accessible Website Design Criteria, we were able to uphold the following design principles:

1.) **High contrast ratio:** The contrast ratio between text and background colors at a minimum of 10.32:1 which is above the criteria of 4.5:1 and 7:1.
2.) **Alternative text:** *Alt text* on all images give a brief hidden descriptions that allows screen-readers to describe what the image is displaying for those who are visually impaired.
3.) **Minimal main navigation pages:** Top navigation bar has minimal pages to compensate for Google Sites not allowing for skippable main navigation.
4.) **Allowing for resizable fonts:** Unable to directly implement a system which could let users change the font size to increase readability due to the limitations of Google Sites. However, the site is compatible with accessible web extensions that edit font size and color, such as A+ FontSize Changer.
5.) **Short paragraph lines:** Paragraph lines are no longer than 80 characters, helping readers that tend to lose their place in a reading easily follow along.
6.) **Alignment of text is not justified:** All text is either right or left aligned allowing the spacing between words to be even, so those with cognitive or reading disabilities can follow the proper flow of the text.
7.) **Line spacing:** The spacing between lines is formatted to be a minimum of 1.5 allowing readers to follow the text easily and not get lost.
8.) **Non-distracting animations:** Animations on the site are kept at a slow speed and can have their motion paused when hovered over.
9.) **Button sizes:** Button sizes are a minimum size of 44 by 44 CSS pixels, with high contrast and consistent coloring so those with visual impairments can distinguish between buttons and other features.
10.) **Descriptive and identifiable headings:** Headings for each section are a consistent font and coloring/contrast for repetitive navigation.
11.) **Keyboard usage:** All navigation and interactive features can be interacted with using just a keyboard. For those that are blind, navigation of the website can be done through the use of a screen reader and a keyboard.

12.) **Language of Text:** Changes between languages are clearly identifiable, through section headings, so as to not confuse a user who cannot see the text on the screen.

The header, depicted in Figure 19, consists of the Rotary Club's logo followed by navigation to each page and a search button which can be used to find certain pages or keywords within pages.


*Figure 19: Website Header*

The rest of the site is comprised of six main pages:

1.) **Home page:** As shown here, this page is used for the following purposes:

   **a.) CulturALL introduction:** Explains the mission statement of CulturALL and a brief description of what a multisensory panel is.

   **b.) Map:** Displays all installations on a map, not just those in Venice. Originally this map was meant to be interactive and would redirect users to an installation's information page, however due to limitations imposed by both Google Sites and our own design criteria a more simplistic option of Google MyMaps was chosen.

2.) **Panel Installation Page:** As seen here, this page includes a church catalog organizing all churches which contain installations in one location. Each church is represented by the image of its façade and a button underneath which links the user to that church's panel page.

3.) **Panel page:** One of the original objectives of the project was to make the panels printable in a usable form, and available to anyone from anywhere. Unfortunately, the file format that the manufacturing company, Lettura Agevolata, uses is niche to their specific printer and isn't widely usable. To overcome this challenge, we gave each church's

installation its own page to display the panel and its information as if it were directly in front of a user by being split up into four sections:

   a.) **The panel:** Displays an image of the panel, which also has *alt text* for a screen reader, and a button to download a .jpeg file of the panel.
   b.) **Panel information:** Displays the information on the panel in a way that replicates the layout of the panel itself. Offers descriptions of the church in both English and Italian along with a pre-made text to speech alternative. Along with pictures of both the outside and inside of the church, each with its own *alt text*.
   c.) **Audio-video descriptions:** Provides links to all videos with descriptive titles of video content and language. These are the same links the QR/NFC technology redirect the user to.
   d.) **Dedications:** Displays the information above the physical panel stamped onto the lectern which contains the and main donor(s) and contributors as well as more information such as its date of installation.

   An example of a panel installation page can be found here.

4.) **Get involved page:** As seen here, this page is intended for others who are looking to adopt the CulturALL initiative, expanding CulturALL beyond RCV. The page explains:
   a.) **Finding a sponsor:** Reasons why one would need a sponsor and explains ways to look for a sponsor/funding.
   b.) **Design and process:** Goes through the design and structure of the lectern and the organization that created the panel.
   c.) **Cost and time:** Gives prospective groups an idea of how much time and money is needed to design and realize their own panel.

5.) **Make a donation page:** As seen here, this page informs potential partners on how they can contribute to the CulturALL initiative instead of expanding upon it. The page appeals to individuals through the option to donate a dedication to be printed on the installation.

6.) **About CulturALL page:** As seen here, this page explains:
   a.) **CulturALL Description:** Retells the beginning of CulturALL, its goals, and its future plans.
   b.) **Collaborators and sponsors**: Acknowledges each sponsor, giving a brief description of their organization and contribution to the CulturALL project.

7.) **Contact us page:** This page gives contact information for organizations or users looking to contribute, expand upon, or learn more about CulturALL.

For graphic visuals of each of the website's pages reference Appendix D: Website pages

# 6. Recommendations and Conclusions

In this section, we will discuss how we believe the future and current implementations of CulturALL can be improved through recommendations informed by this study. The recommendations cover suggestions for the structure of the panels, cleanliness/maintenance of the installations, and location of the panels.

## Location

***We recommend that panels be placed in a prominent location within the church to maximize their usage.***

The importance of the panel location should be emphasized to churches that receive installations in the future. Ideally, panels should be placed along the church's axis of symmetry or the main path of circulation, always facing down the aisle toward the church. The RCV should discuss with church officials about moving current panels into more prominent locations within churches such as Santo Stefano, Santa Lucia, and San Moise. Installations with more prominent locations within the church saw a greater percentage of use. San Rocco, San Zaccaria, Basilica Della Salute, and Basilica dei Frari all were deemed to have good locations within the church, and they also rank as the top four churches by panel use percentage, seeing 45%, 22%, 18%, and 17% respectively. In contrast, Santo Stefano, Santa Lucia, and San Moise all had usage percentages of below 10%.

***We recommend that the location of the multisensory panel within the church be labeled on the panel.***

This provision would allow a blind/visually impaired person to more effectively orient themselves within the space, even if the panel has to be placed in a less optimal location. The panels in Aquileia, some of which date back to 2018, all feature location markers, illustrating that this addition is possible. Due to the fact that panels may have to be moved for events or services, a marker that can be easily moved and placed appropriately on the panel, such as a tactile sticker.

## Cleaning and Maintenance

***We recommend a cleaning protocol be put in place to prolong the life of the installations.***

We advise the churches with panels to clean them at a minimum of once per day with spray on plastic cleaner and a soft cloth, similar to the installation at Basilica di Santa Maria Assunta in Aquileia, Italy which cleans their panel every hour and maintains a brand-new look. In order to accomplish this, we stress that Rotary Club of Venice should get in touch with the janitorial staff of each church to inform them of the need to maintain these panels. As mentioned in

4.2 Physical State of the Panels, panels old and new have grown dirty, with the adhesive on most of them starting to wear away. With the oldest ones dating back five years at the time of writing, such aging is to be expected, however, even some of the newer panels have notable degradation. Referring to Figure 14, the panel in Basilica Santa Maria Della Salute is depicted in its current state, with chipped-away embossing and significant discoloration around the braille features. Despite being less than two years old, dating back to 2022, we found it to be the dirtiest from the observations. Moreover, the second and third dirtiest, Chiesa di San Zaccaria and San Moise, also saw the second and fourth most users in the observations, respectively.

***We recommend the installations be reviewed for heavy maintenance or renewal every five years.***

Some signs of degradation, such as discoloration and worn-away embossing can be difficult to repair, so the installations may benefit from a full replacement. Such renewal can also help to keep the technology from this ever-changing field up to date. Lettura Agevolata has been experimenting with microcapsule printing, which can be much more easily produced, and research being conducted in the area of 3D-printed tactile maps and braille may result in further enhancements to these installations.

# Lectern Enhancements

***We recommend prolonging the life of the lectern structure in the short-term through cost-effective reinforcements.***

Two alternative designs have been created for consideration shown in Figure 20 Figure 21 with alternative 2 suggested for further consideration. For more information on the two designs, Appendix G: Short-Term Lectern Reinforcement Suggestions, can be referenced. It is crucial that repairs and reinforcements be made to the base, which is often warped in an upward curve to create a forward and backward rocking. Regardless of which alternative is chosen by RCV, refreshed lecterns should be given a new coat of paint.

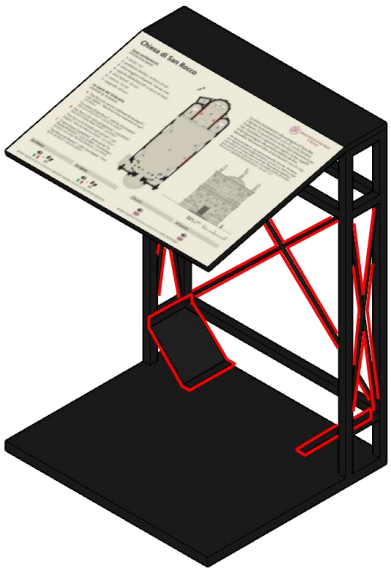


*Figure 20: Design 4 Alternative 1 using cross bracing with metal bars.*

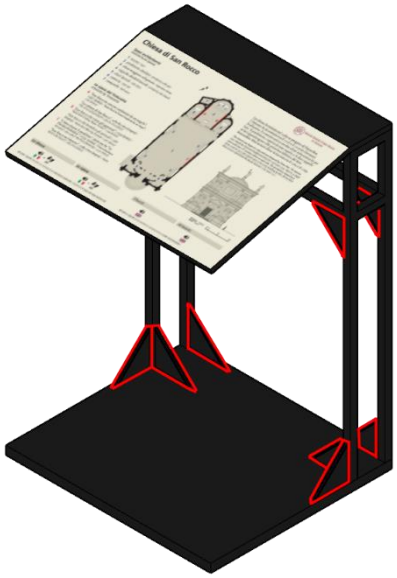


*Figure 21: Design 4 Alternative 2 using aluminum gussets at the corners for support.*

***We recommend replacing the lectern structures with a plastic-based design in the long term.*** As noted in the meeting with Leonardo De Carlo, the metal structure used for the multisensory panel lecterns is prone to rusting, creating a source of degradation. We believe his insight on this matter to be of considerable importance, and that his guidance of replacing the structure altogether, perhaps at the end of the next replacement cycle in five years to allow ample time for research, design, and funding to be carried out. Designing a new lectern enables future panels to be larger and more robust, such as the ones installed in Aquileia and Trieste. Furthermore, use of transparent plastic can align more strongly with the original vision of "invisibility" for the lectern, further highlighting the panel instead of the structure. An example of transparent plastic applied to this use can be found in Figure 22 below. Note that the image does not represent a proposal for a CulturALL lectern; it merely illustrates what has been done already and can be applied to CulturALL by resizing for the panels and sponsors and shaping for wheelchair accessibility.

*Figure 22: An example of a transparent plastic lectern which can be applied for use by RCV*

("Custom Made Plastic Lecterns & Podiums," n.d.)

## Digital Recommendations

***We recommend that future CulturALL multisensory panel installations be documented on the database and website.***

Documenting each existing and new installation as soon as possible helps to make sure every installation is brought under the CulturALL network, lessening the need for work to be done later. This measure would maximize information accuracy by minimizing time between installation and recording of data, helping to streamline data consistency in the process.

***We recommend using the QR code technology to additionally direct users to the panels page on the website.***

We noted in the observations that users tended to photograph the map, presumably to use its information and orient themselves as they navigate the church. To enhance the experience of map users, they can be provided a link via QR code to the installation's web page and gain access to a high-quality image of the map and its contents to enhance their experience. Such a demand for portability stresses the importance of integrating future installations with the website.

***We recommend documenting the art within the churches on the website.***

Providing photographs of the artwork on the website would provide convenient access to all works of art present in the churches with multisensory panels. When we attempted to take these photos ourselves, we found that several churches, such as Chiesa di Santo Stefano and Santuario di Lucia, disallow photography of their art. RCV should reach out to its church contacts to secure permission to take photos and put them on the website.

***We recommend looking into making the panels printable in the future.***
Allowing users to print the tactile portion of the multisensory panels from home would enhance the utility of the website substantially. Lettura Agevolata has described Microcapsule printing as being a new and easier way to print from home, enabling those with an embossed printer to print the panel at home before visiting the churches. This printed copy would also be effective for them to be able to use the panel as they walk around the church.

# Further Work

***We recommend expanding upon the website.***
While robust, the site remains rather rudimentary. Moving to a different site host other than google sites long-term as the site's needs change would allow for more complex integration of other forms of technology, especially as CulturALL continues to grow. Additionally, going to a different site could help with accessibility needs and more features can be added to personalize the site how the RCV would want it.

***We recommend looking into creating virtual reality experiences for the panels and churches.***
Creating a VR replication of the churches would be an extraordinary way to provide the culture of Venice and the churches to the broadest audience and would align with one of CulturALL's four tenets. Thus, allowing anyone regardless of location or mobility to experience the wonders of the cultural heritage within the sitting. We explored this possibility through the render software Enscape to create a 3-D panorama, which showed promising potential. Further alternatives and specialized software should be considered to develop this idea.

***We recommend conducting a future study on the use of the panels by relocating a panel.***
Relocation of a multisensory panel from a poor location to a prominent one would provide experimental data which can be used to further verify the data collected as part of this project. We were unable to establish contact with a church due to time constraints and theirs, due to a visit from Pope Francis. We think if given more time, such an experiment would be possible, and that it should be considered.

# Conclusion

Over the past five years, the CulturALL initiative has achieved milestones in making cultural heritage accessible for all and is laying the groundwork to inspire other organizations to do the same. Having read about the expansions around Italy and seen the project grow in Aquileia first-hand, we found ourselves excited and inspired by the CulturALL program and the potential that it holds. Through our research we learned about the future possibilities of 3D printing tactile panels and braille features which could help lower costs and make production easier. We ourselves were inspired by the fourth undeveloped tenet of CulturALL, virtual reality, by creating an initial exploration into viewing these panels through VR with the hopes that it can be developed further.

It is our hope that this study can help the RCV and those involved continue expanding the CulturALL initiative on a global scale. We would like to see the recommendations yield positive results, allowing more users to experience the multisensory panels and for RCV to continue strengthening its work. Furthermore, we hope the data we collected can continue to serve a use to future volunteers or researchers working with CulturALL to further their work as well.

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# Appendix A: Observation Protocols

The steps to this protocol are as follows:

1. Team will pair off into groups of two. Each team visits one church per day.
    a. This enables the team to visit all eight (open) churches in four days**.
2. Each team will visit each church once in the morning (11AM-12PM) and once in the afternoon (2PM-3PM) from Monday-Thursday.
3. Inside the church, one team member will watch the tactile panel to count the number of people who interact with it and collect specific observations for it. The other will keep track of how many people enter the church. The data will be used to see what proportion of them use the map.
4. Data will be collected through the following observations:
    a. How many total people enter the Church
    b. How many people view/read the panel without interacting with tactile features
    c. How many interact with the embossing/braille
    d. How many people scan the QR code
        i. Did they use the volume on?
        ii. Did they have headphones/earbuds?
    e. How long someone uses the map for
        i. We will first decide how long people tend to use the map and then using that time decide whether a user.
            1. Uses for a shorter amount of time
            2. Uses or the same amount of time
            3. Uses for a longer amount of time
5. We will use a form to organize and collect data more conveniently as we observe.
6. We will also collect information on the Church/Panels
    a. Number of steps into the church
    b. Location of panel within the church
7. For the Location of the Panel, we will indicate where the panel is using a map and give a written description on where it is located within the church with the following guidelines
        i. Where is the panel facing?

ii. Is it on a common walking path?

iii. Are there obstructions?

iv. Is the panel easily visible from the entrance?

8. For the state of the panel we will observe different aspects of the physical structure and provide a description as well as take photos. We will take note of the following on a separate document titles Panel Conditions during the observations:

    a. Adhesive connecting the panel and lectern

    b. Up keep of Panels

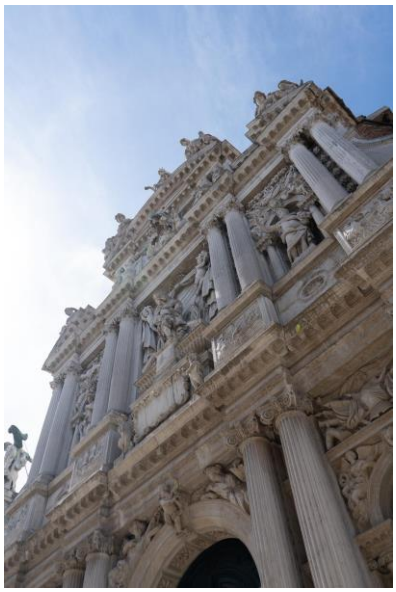
        i. Cleanliness of the panel and lectern

        ii. Scratches/Marks on the panels

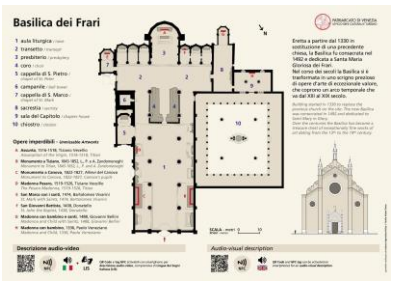
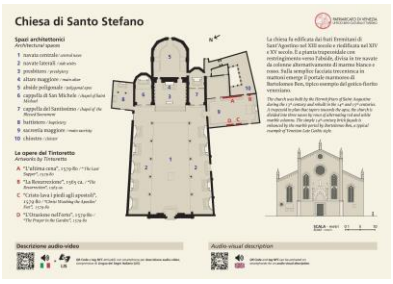
    c. Lectern integrity and design

# Appendix B: Photographs of Each Church

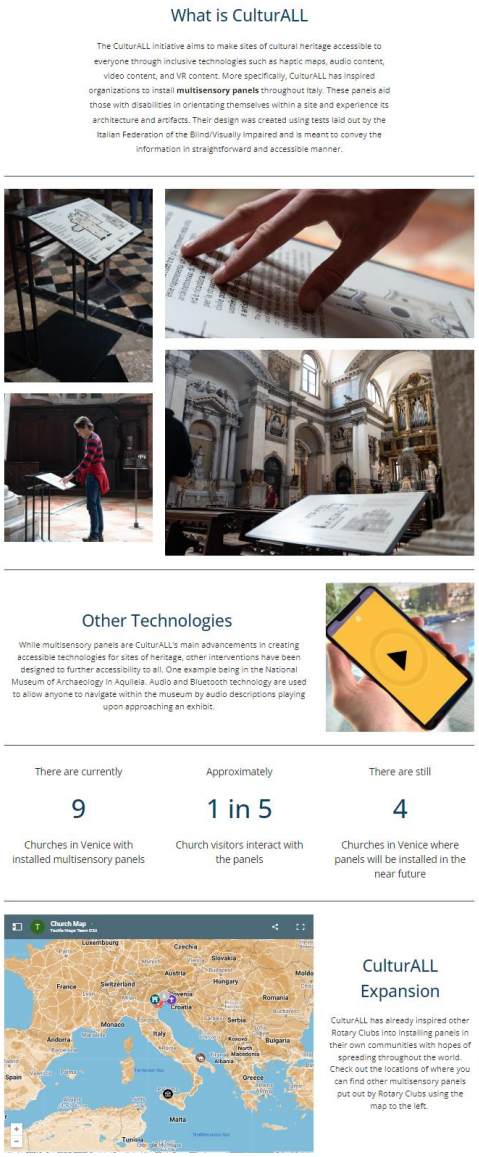
| | | |
|---|---|---|
|  |  |  |
| Basilica Santa Maria della Salute | Basilica Santa Maria Gloriosa di Frari | Basilica dei Santi Giovani e Paolo |
|  |  |  |
| Chiesa di San Moise | Chiesa di San Rocco | Chiesa di San Zaccaria |

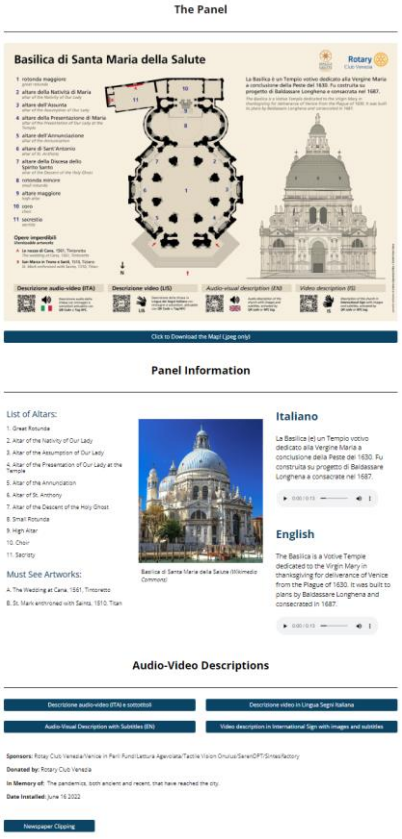
| | | |
|---|---|---|
|  |  |  |
| Chiesa di Santa Maria del Giglio | Chiesa di Santo Stefano | Santuario di Lucia |

# Appendix C: Pictures of Each Panel

| | | |
|---|---|---|
|  |  |  |
| Basilica Santa Maria della Salute | Basilica Santa Maria Gloriosa di Frari | Basilica dei Santi Giovani e Paolo |
|  |  |  |
| Chiesa di San Moise | Chiesa di San Rocco | Chiesa di San Zaccaria |
|  |  |  |
| Chiesa di Santa Maria del Giglio | Chiesa di Santo Stefano | Santuario di Lucia |

# Appendix D: Website pages

| Image no. | Image content | Image |
|---|---|---|
| 1 | Website homepage |  |

| | | |
|---|---|---|
| 2 | Panel installations page |  |
| 3 | Panel page for Basilica S.M. della Salute |  |

| | | |
|---|---|---|
| 4 | Get involved page | |

## Adapting CulturALL to Your Organization

CulturALL is intended to be spread to as many sites of culture and heritage as possible. If you or the organization you represent have an interest in doing the same, we encourage you to follow our guidelines and help to expand it!

### Finding a Sponsor

The cost of developing a multisensory panel installation can be offset significantly if you can identify a sponsor or donor to assist with funding.

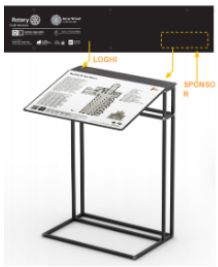
To attract funding from an organization, it is best to look toward companies local to the site which will receive the panel. This way, it is easier to find organizations with deeper ties to the area, and perhaps even the site in particular. You can offer to print their name or logo on the panel, so that visitors see their involvement and commitment to culture and their local environment when they see the panel. The right side of the lectern above the panel is dedicated for this purpose.

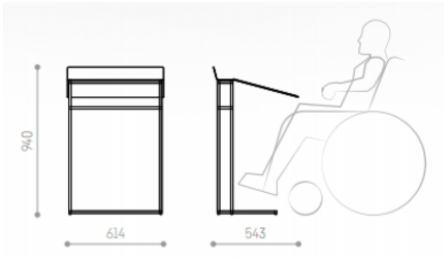
Individuals can also become involved in funding a multisensory panel. By offering incentives, such as the ability to dedicate their donation in memory of a loved one, individuals can donate so their name or the name of whom they are dedicating their donation for will be placed on the panel. Different tiers can be established so potential donors have a structure with different incentives organized by price points to select from. Ample space is provided so multiple donors with dedications of various sizes can be accommodated. **If you are interested in making a donation, look here!**

### Design and Process

The multisensory panel typically includes a tactile overview graphic, such as a floor plan or building facade, as well as a description and/or list of notable spots within the site, both of which have braille overlay for blind/visually impaired users. The panel provides QR codes for sign language-capable description videos for deaf/hard of hearing users.

The panel is set on a metal lectern 614 mm wide and 940 mm high, allowing both standing and seated individuals to view the panel comfortably. With 543 mm of depth, the lectern is designed to accommodate individuals with wheelchairs, thus ensuring accessibility by a broad range of people.




Lettura Agevolata will design your panel to their standard, which has been tested by the Italian Federation of The Blind, and print it using their custom process. The embossed material is printed onto a plastic PVC surface, which is then heated within an oven to rise and provide the tactile overlay. A relief is then added atop the PVC to protect the braille and embossing. Finally, the panel is placed atop the metal lectern, which is constructed by hand and printed with all donors and sponsors.

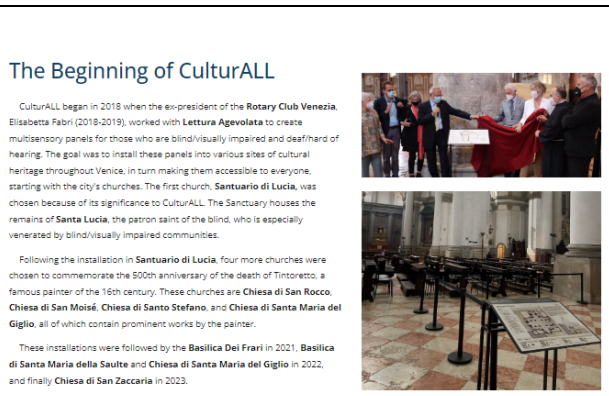
### Costs and Time

The production process of a multisensory panel takes an average of two months to complete, and costs an average of 5,000 Euros. Rotary Club Venezia reports that 40 hours of commitment can be expected from the average Rotarian.

### Want to Get Involved?

If you are interested in helping your local Rotary Club to help expand CulturALL, please see more information by clicking the button below.

Get Involved!

| | | |
|---|---|---|
| 5 | About CulturALL page |  |

## The Beginning of CulturALL





CulturALL began in 2018 when the ex-president of the **Rotary Club Venezia**, Elisabetta Fabri (2018-2019), worked with **Lettura Agevolata** to create multisensory panels for those who are blind/visually impaired and deaf/hard of hearing. The goal was to install these panels into various sites of cultural heritage throughout Venice, in turn making them accessible to everyone, starting with the city's churches. The first church, **Santuario di Lucia**, was chosen because of its significance to CulturALL. The Sanctuary houses the remains of **Santa Lucia**, the patron saint of the blind, who is especially venerated by blind/visually impaired communities.

Following the installation in **Santuario di Lucia**, four more churches were chosen to commemorate the 500th anniversary of the death of Tintoretto, a famous painter of the 16th century. These churches are **Chiesa di San Rocco**, **Chiesa di San Moisé**, **Chiesa di Santo Stefano**, and **Chiesa di Santa Maria del Giglio**, all of which contain prominent works by the painter.

These installations were followed by the **Basilica Dei Frari** in 2021, **Basilica di Santa Maria della Saulte** and **Chiesa di Santa Maria del Giglio** in 2022, and finally **Chiesa di San Zaccaria** in 2023.

View each panel here!

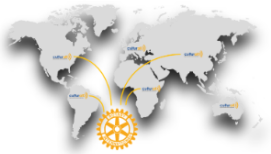

## The Goal

The Goal of CulturALL is to make sites of cultural heritage, such as museums, theatres, places or worship, and cities/historical centers, through accessible technology that can be used by everyone.

Look at what some of the technologies Rotary Clubs from around Italy have implemented so far here!

## Future Plans

While starting in Venice, Italy, in order to truly make cultural heritage accessible by all, CulturALL plans to expand globally. Efforts have already been made throughout Italy in cities such as Aquileia, Trieste, Palermo, Bari, Castelfranco Veneto, and Passariano.



**Collaborators and Sponsors of CulturALL**

Rotary Club Venezia

Rotary is a global network of 1.4 million enterprising men and women, friends, acquaintances, professionals and entrepreneurs who believe in a world where all peoples, together, promote positive and lasting change in nearby, distant communities, in each and every one of us. Rotary Club Venezia was established in 1924 with a commitment to improving Venice through collaboration, in tune with the spirit of Rotary International.

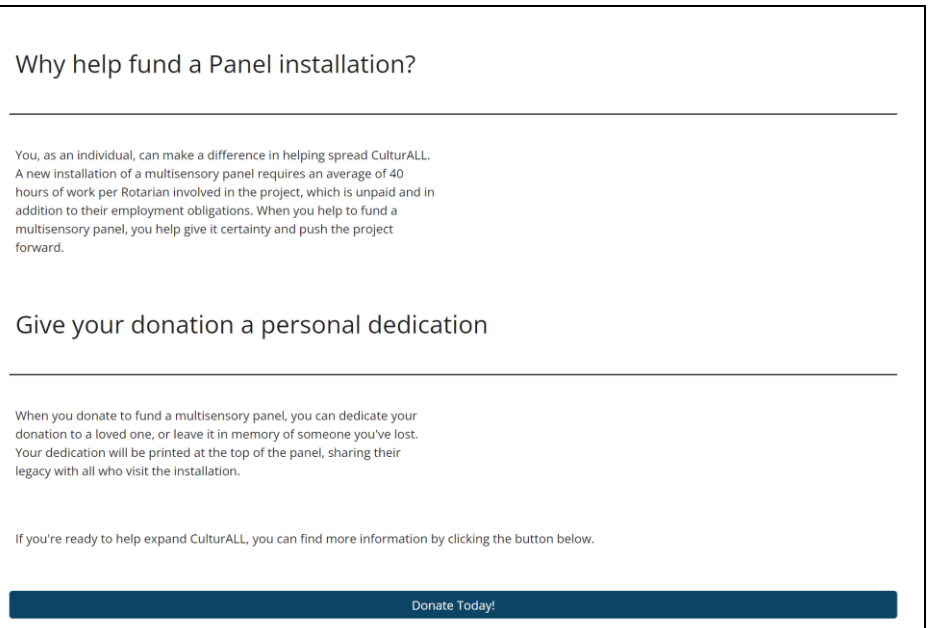
The Club conceptualized CulturALL initially based on the multisensory maps project, which it began funding in 2018 under the leadership of former president Elisabetta Fabbri (2018-2019).

Lettura Agevolata

Lettura Agevolata is a non-profit organization, founded in 2010 on the heels of the Facilitated Reading Project of the Municipality of Venice (2000-2010). It carries out information, training, consultancy, planning and research activities to promote social integration and access to education and culture.

The CulturALL project was born from an initial collaboration with President Lucia Baracco of Lettura Agevolata and Elisabetta Fabbri of the Rotary Club of Venice. It has contributed to the CulturALL project by designing and coordinating the construction of each Tactile Panel.

The Tactile Vision Onlus is a non-profit association that works and offers its advice for the visually impaired, according to the principles of

| | | |
|---|---|---|
| 6 | Donate page |  |
| 7 | Contact Us page |  |

All screenshots come from the following link: https://sites.google.com/d/11HwA2olVVOxTwau6PHh31qmAZKEmB34z/p/1x1rGXicrbWWiSTmopMqpUDJQzN51eQng/edit

# Appendix E: Accessible Website Design Criteria

## Text

| | |
|---|---|
| Alternative Text/longdesc; Provide text alternatives for any non-text content so that it can be changed into other forms people need, such as large print, braille, speech, symbols or simpler language. | ADA |
| Font and color should be able to be edited by other software<br>- High contrast<br>- Not too wordy | W3C |
| All text should have alt text except:<br>- Controls (such as enter your name<br>- Time based Media<br>- Sensory<br>- Decoration, Formatting, Invisible | W3C |
| General visual presentation of text and images of text must have a contrast ratio of at least 4.5:1<br>Large text (>= 18 pt/14 pt bold) can have a ratio of 3:1<br>- If using gradient, take lightest color in gradient for ratio test | W3C |
| The visual presentation of text and images of text has a contrast ratio of at least 7:1, | W3C |
| Inclusion of a skip navigation button | ADA |
| Label whether something has captions or what features it contains<br>- NOT REQUIRED IF: the audio-only or video-only files are an ALTERNATIVE for text based options in which case they need to be labeled as such | W3C |
| Provide 200% resizability without assistive technology<br>- Use em units to specify height and width (em is relative to font size) | W3C |
| Text for an inactive UI component or for decoration do not have contrast retirement. Logos do not have contrast requirement | W3C |

| | |
|---|---|
| Color is not used as the only visual means of conveying information, indicating an action, prompting a response, or distinguishing a visual element. | W3C |
| If the technologies being used can achieve the visual presentation, text is used to convey information rather than images of text except for the following:"<br>- If the text in the image can be customized by the user<br>- The text is essential to the image being conveyed | W3C |
| Width is no more than 80 characters or glyphs (40 if CJK). | W3C |
| Text is not justified (aligned to both the left and the right margins). | W3C |
| Line spacing (leading) is at least space-and-a-half within paragraphs, and paragraph spacing is at least 1.5 times larger than the line spacing, line height (line spacing) to at least 1.5 times the font size, spacing following paragraphs to at least 2 times the font size; | W3C |
| Letter spacing (tracking) to at least 0.12 times the font size, word spacing to at least 0.16 times the font size. | W3C |

**Images**

| | |
|---|---|
| No blinking, flashing or overly distracting images, text, etc | ADA |
| Make sure any moving thing of images or text can be stopped | ADA |
| Large scale images 3:1 | W3C |
| SC3 Label in Name:For user interface components with labels that include text or images of text, the name contains the text that is presented visually. | W3C |
| The size of the target for pointer inputs is at least 44 by 44 CSS pixels | W3C |

**User Interactions**

| | |
|---|---|
| Provide descriptive headings for sections of content for content structure and keep consistent structure for web pages | W3C |

| | |
|---|---|
| Provide title that describes topic and purpose of each web page | W3C |
| “If you use online forms and tables, make those elements accessible by labeling each control (including buttons, check boxes, drop-down menus, and text fields) with a descriptive HTML tag.” | ADA |
| Use titles, context, and other heading structures to help users navigate complex pages or elements (such as webpages that use frames) | ADA |
| Make sure user can exit embedded content with keyboard | W3C |
| Provide language of content if necessary | W3C |
| Allow users to have alternative ways of navigating the site, arranging repeated content in a specific order across the different pages. | W3C |
| Do not use visual indicators in descriptions (e.g. the red button, the left hand size of the page) | W3C |
| Provide suggestions for fixing errors when applicable | W3C |
| Dynamic Content<br>Provide name, role, state and value of all components<br>- Name (label)<br>- State (e.g. checked/unchecked, expanded/collapsed)<br>- Role (input type) | W3C |
| Maximize compatibility with current and future user agents, including assistive technologies. | W3C |
| All functionality of the content is operable through a keyboard interface without requiring specific timings for individual keystrokes,<br>except where the underlying function requires input that depends on the path of the user's movement and not just the endpoints. | W3C |

| | |
|---|---|
| Foreground and background colors can be selected by the user. | W3C |
| Navigational mechanisms that are repeated on multiple Web pages within a set of Web pages occur in the same relative order each time they are repeated, unless a change is initiated by the user. | W3C |
| For any auto-updating information that (1) starts automatically and (2) is presented in parallel with other content, there is a mechanism for the user to pause, stop, or hide it or to control the frequency of the update unless the auto-updating is part of an activity where it is essential. | W3C |
| Timing is not an essential part of the event or activity presented by the content, except for non-interactive synchronized media and real-time events. | W3C |
| For any moving, blinking or scrolling information that (1) starts automatically, (2) lasts more than five seconds, and (3) is presented in parallel with other content, there is a mechanism for the user to pause, stop, or hide it unless the movement, blinking, or scrolling is part of an activity where it is essential | W3C |
| Limit mouse movement | W3C |
| Vertical scrolling content at a width equivalent to 320 CSS pixels and horizontal scrolling content at a height equivalent to 256 CSS pixels, except for parts of the content which require two-dimensional layout for usage or meaning. | W3C |

**Audio and Video**

| | |
|---|---|
| If any audio on a Web page plays automatically for more than 3 seconds, either a mechanism is available to pause or stop the audio, or a mechanism is available to control audio volume independently from the overall system volume level." | W3C |
| Provide audio descriptions to make videos accessible to people who are blind or have low vision. | ADA |
| Provide text captions synchronized with the video images to make videos and audio tracks accessible to people who are deaf or hard-of-hearing. | W3C |
| Do not design content in a way that is known to cause seizures or physical reactions. | W3C |

| | |
|---|---|
| Motion animation triggered by interaction can be disabled, unless the animation is essential to the functionality or the information being conveyed | W3C |
| The user is allowed to turn off time limits before encountering them, or is able to adjust it to a range at least ten times the default setting.<br><br>User is warned before time expires and is given at least 20 seconds to extend the time with a simple action (like pressing the space bar) and is allowed to extend the time limit at least ten times | W3C |
| When conveying data, use simple tables instead of complex tables whenever possible | W3C |

# Appendix F: Interview with Leonardo De Carlo

**Meeting Location: Zoom**
**Meeting Date: 22 April 2024**
**Meeting Time: 12:00-12:30 pm**
**Meeting Attendees: Benjamin Coe, Leonardo De Carlo**

Leonardo De Carlo is an architect practicing in Italy and Europe, specializing in furniture. In 2018, he designed the lectern used by Rotary Club Venezia (RCV) for the multisensory panel installations in the churches of Venice.

Some notes from the interview are listed below:

1. How did you become involved in the Tactile Maps project?
    a. Involvement began through a prior connection with Elisabetta.
2. What year did your involvement in the Tactile Maps project begin?
    a. Joined the project in 2018 at the inception of CulturALL.
3. Which material is used for the lectern structure?
    a. Lectern consists of painted aluminum bars.
    b. Original joints were industrial grade, chrome finished.
    c. Materials were chosen from industrial parts to be easily mass-produced.
4. What is the expected lifespan of the tactile map lectern?
    a. Lecterns do not have a set lifespan.
5. What design choices did you consider when creating the lecterns for the Tactile Maps?
    a. Two lecterns were proposed, featuring designs inspired by famous Italian architects.
    b. Lectern was designed to be “invisible” as a prime consideration from RCV.
6. What measures were taken to reduce sway in the design?
    a. Lecterns were designed with an iterative process; it was found that the original joints provided sufficient support.
7. When working on the lectern design, were you aware of the ongoing work on the tactile maps in Aquileia and Trieste?
    a. Leonardo was not made aware of the different designs used in Aquileia and Trieste.
8. Are you aware of the changes that have been made to the design over time?
    a. Leonardo was not made aware of the change of joint material, however he was aware the supplier of the lectern parts was changed.
9. What changes would you make, if any, if you were given the chance to remake the design?

    a. Maps were intended to be placed in non-humid environments, however because they were, rusting has occurred.
    b. Would change material from metal to plastic to avoid rusting.

10. What is the cost of a lectern?
    a. Lecterns would cost between 500 and 600 EUR.

# Appendix G: Short-Term Lectern Reinforcement Suggestions

Design 4 Alternative 1 is pictured above. This design adds the diagonal plates from design 2 and adds crossbars at the bottom on the left, right and far sides, leaving space at the front for wheelchair access. On these three sides, diagonal bars are implemented to create X-bracing. The solid bars resist the tensile stresses created when the lectern is subject to force, and the implementation on three sides will help it resist these stresses in multiple directions. The metal bars would be easy to produce and purchase in bulk and can work with the existing structure, costing $26.16 per lectern (*6061 Aluminum Round Bar*, n.d.), with diagonal steel plates similar to design 2 costing a further $18.78 when purchased in sheets of 1’x2’ for a total of $44.94 (*A36 Steel Plate*, n.d.).


Design 4 Alternative 2 is pictured above. Inspired by lectern design 2, this alternative makes use of ten painted aluminum gussets to reinforce the critical joints at the base and lower crossbars: six at the base and four at the lower crossbars. As well as resisting horizontal sway, this design also connects reinforcement directly to the base to resist sway from several directions. The gussets, ⅛'' thick and measuring 4''x4'', cost $3.75 per (*Aluminum Gusset Plate*, n.d.), amounting to a 37.54 EUR cost of acquisition for each lectern. Based on welding speed estimates for TIG (Tungsten-Inert Gas) welding of 4 inches of weld per minute (Neville, 2023) in addition to fit-up times to position each gusset, each lectern could take 1-2 hours to retrofit, necessitating an installation cost of roughly 200 EUR (*How Much Does Welding Cost in 2024?*, n.d.). This amounts to a total estimated retrofit cost of 237.54 EUR per panel.

# Appendix H: Authorship

| Section | Author(s) |
|---|---|
| Abstract | **All** |
| Executive Summary | **All** |
| 1. Introduction | **Jake Olsen** |
| 2. Background | **Brian Leverock** |
| 2.1 The Importance of Cultural Heritage | **Brian Leverock** |
| 2.2 Making Culture Accessible | **Benjamin Coe** |
| 2.2.1 Tactile Maps for the Blind and Visually Impaired | **Benjamin Coe** |
| 2.2.2 Resources for the Deaf and Hard-of-Hearing | **Benjamin Coe + Jake Olsen** |
| 2.2.3 Further Developments to Accessible Technology | **Benjamin Coe + Jake Olsen** |
| 2.3 Expanding Access to Venetian Culture | **Jake Olsen** |
| 2.3.1 The CulturALL Initiative | **Brett Marelli + Benjamin Coe** |
| 2.3.2 CulturALL Multisensory Panels | **Brett Marelli + Benjamin Coe** |
| 2.3.3 Spreading Knowledge of the Churches in Venice Online | **Brett Marelli + Benjamin Coe** |
| 3. Methodology | **Benjamin Coe + Brian Leverock** |
| 3.1 Collecting Information on Venice's Multisensory Installations | **Benjamin Coe** |
| 3.1.1 Visiting the Multisensory Installations | **Benjamin Coe + Jake Olsen** |

| | |
|---|---|
| 3.1.2 Observing the Use of the Panels | **Benjamin Coe + Jake Olsen** |
| 3.1.3 Inspecting the State of the Installations | **Benjamin Coe** |
| 3.2 Website Design and Implementation | **Brett Marelli + Brian Leverock** |
| 3.2.1 Identifying Key Features to Enhance Ease of Use for All | **Brett Marelli + Brian Leverock** |
| 3.2.2 Designing with the Intent to Inspire Replication | **Brian Leverock** |
| 3.2.3 Identifying Suitable Site Host | **Brett Marelli + Jake Olsen** |
| 3.2.4 Gathering Source Data of the Multisensory Panels | **Brian Leverock** |
| 4: Multisensory Panel Placement, Condition, and Usage | **Brett Marelli + Jake Olsen** |
| 4.1 Non-uniform Panel Usage Across Churches | **Brett Marelli + Jake Olsen** |
| 4.2: Physical State of the Panels | **Brett Marelli** |
| 4.3: Multiple Structure Designs of the Lectern | **Brett Marelli + Benjamin Coe** |
| 5: Design Features for the Website | **Jake Olsen + Brian Leverock** |
| 6: Recommendations and Conclusion | **Benjamin Coe** |
| 6.1: Recommendations | **Benjamin Coe** |
| 6.2: Future Steps and Final Thoughts | **Jake Olsen + Brian Leverock** |

*Editing was completed as a team effort.