Sophie Brenny and Jun Hu

Department of Industrial Design, Eindhoven University of Technology

s.m.j.brenny@student.tue.nl, j.hu@tue.nl

Social Connectedness and Inclusion by Digital Augmentation in Public Spaces

Abstract

With several design iterations we explored the ways of increasing people's feeling of inclusion and connectedness in a public space using interactive public art installations as media. The study used the Social Connectedness Revised Scale and the pictorial Inclusion of Community in Self as measurement tools and a university cafeteria as the context. Experiments were carried out to investigate the possible difference among several types of interaction elements, examining the influence on people's perceived sense of inclusion and connectedness to others who were present in the same space. Subsequent interviews were conducted to support the findings of the questionnaires and to shed light on some of the results. The results showed a notable difference when the physical space was augmented with interactive digital content.

Keywords

Social connectedness, social inclusion, public spaces, interactive public arts

1 Introduction

Cities are evolving at a rapid pace. A problem of this rapid evolution is that people may feel less and less connected to their city as they may find it challenging to keep up with all the changes. In public spaces people usually do not spend much time. A way to engage people in interacting more with their city is through public art installations where onlookers change their participative roles from spectator to actor by influencing the art piece in their own way [1-4]. Improving quality of life are issues that many growing cities must deal with. People want a better quality of life. To increase the quality, cities are turning in part to strategies to heighten the sense of inclusion and connectedness of their citizens. Making spaces inclusive instead of exclusive is a trend that is growing worldwide, particularly in city planning for newly evolving Chinese cities [5, 6]. The design context for the concept is public spaces across a city. On these locations a network of the installation "Leave your mark" would be placed to allow people to freely express themselves on a blackboard. This would enable them to augment the public space in which they find themselves with a digital added element connecting several locations of the city together. This approach is to help people feel more connected with and included in the space they are in.

We started the project by asking ourselves the question "how to design a public digital art installation with digital augmentation to physical spaces to increase people's feeling of inclusion and connectedness?" To answer this question, taking into account our initial concept of leaving their marks, the first step was to determine whether, if people were given tools in the form of markers and papers in a public space, they would use them. If this

was not the case, the whole project could be stopped at that stage. From this question we derived a hypothesis:
H1: When giving people a designated place to express themselves with tools to do so (pen and paper for example), they will not do so.

If H1 can be rejected, we could take the concept further. Buildings in a public space consist of a mix of geometric shapes. When creating an interactive public art installation system, geometric shapes are thus truly important and should be taken into account to fit the surroundings. A few more hypotheses were then derived:
H2: People will not use the geometric shapes for their forms of expression.
H3: People will not use the geometric shapes for their forms of expression when hints to this option are given.
H4: Even when giving people hints to the possibility of using geometric shapes, their sense of connectedness is not different from when only using a plain blackboard with nothing added.

We introduced a blackboard in later experiments for people to leave their marks. A blackboard is a medium that has a low threshold, and that everyone knows how to interact with. The blackboard was thus made to explore if such types of expressions do, or do not, influence people's feelings of inclusion and connectedness. The digital element that will be discussed later in this paper is an addition to this exploration. To study people's sense of connectedness and inclusion with the blackboard, four more hypotheses were proposed:
H5: People's sense of connectedness to the space – and to others in the same space – will not be increased by letting them express themselves in a designed way with the blackboard in the public space.
H6: Projecting a feed from one blackboard on another, allowing people to see other's drawing, etc. will not influence their sense of connectedness.
H7: Letting people express themselves in a controlled manner with the designed blackboard in the public space will not influence people's sense of inclusion.
H8: Projecting a feed from one blackboard to another, allowing people to see others' drawing will have no influence on their feeling of inclusion.

We will first introduce some related existing concepts and will then describe the proposed concept. This will be followed by the initial explorations conducted in line with the above mentioned research question and hypotheses. The tools used will subsequently be explained, followed by an explanation of the final experiment, including the setup, participants and procedure. The results will then be presented and discussed and finalized with conclusions.

2 Related work

Many people have seen graffiti put on a wall or building or even very elaborate chalk drawings on the ground of a public space in their city. People expressing themselves in creative ways in the public space can thus been seen as an event that has some history. But next to these unorganized, often illegal forms of expressions there are also designs or organized events that give individuals in the space the chance to express their individuality and share their thoughts with their community. Flash mobs are such an example.

"Infecting the city" is a small festival in Cape Town, South Africa (Fig. 1(a)). Initiated by the Africa Centre, the festivals' goal is an endeavor to kindle the interconnectedness of the people in the city through artistic expressions, as they say "making the public space public" [7].
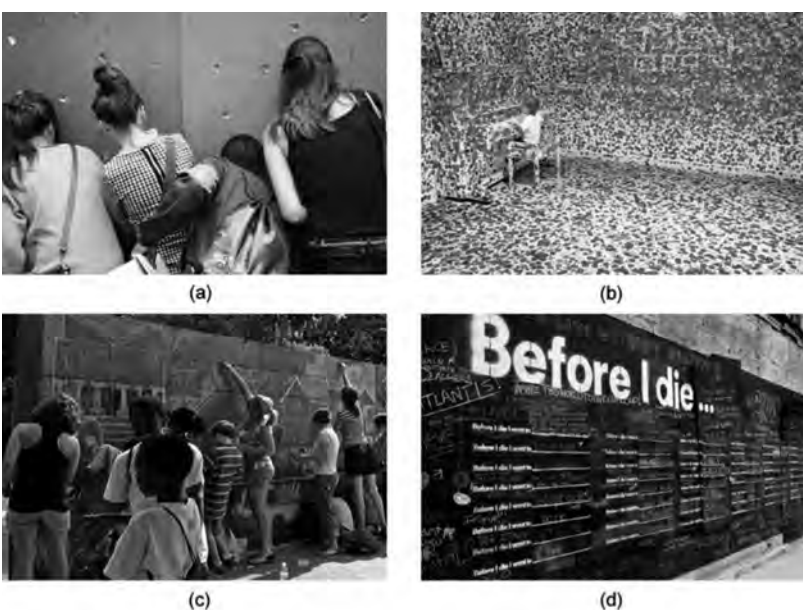

Fig. 1. (a) a public art installation in Cape Town, South Africa [7]; (b) the Obliteration room [8]; (c) Community Chalkboard [9]; (d) Before I Die [10]

Japanese artist Yayoi Kusama created the Obliteration room (Fig. 1(b)). Her white living room is personalized by every visitor to the space who is provided with a colored sticker dot that they can choose to put wherever they wish in the space. This means that every dot is the expression of the visitors experience in that space [8].

Community Chalkboards created by the Company Site works in Charlottesville Virginia (Fig. 1(c)), in the United States consists of a public chalkboard. It represents a memorial for the first amendment where anyone can share their thoughts and opinions [9].

Candy Chang started the "Before I Die" project after losing a loved one (Fig. 1(d)). Before I Die started in New Orleans. It is a chalk board with a grid created with the start of the sentence "Before I Die..." with room for people to fill in the rest of the sentence. Anyone who walks past this chalkboard can pick up a piece of chalk and write down what they want to do before dying. The inspiring project has since expanded to 189 other cities across the globe [10].

Research that studies the effects of intrinsic and extrinsic motivation, in some cases is closely related to the topic at hand [11, 12]. Research conducted in the field of inclusion and connectedness has mostly been conducted on a purely digital or purely physical field. Such research used tools like blogs and mobile phones for the concepts. An example is the work by Shuk Ying Ho who studied the effects of location personalization on individuals' intention to use mobile services [13].

This research differentiates itself by combining the digital and the physical while using tools for measuring inclusion and connectedness for public art installations in a public space. Next the concept "Leave you mark" is briefly described

3 "Leave your mark"
People were provided with an opportunity to interact in a playful way by "drawing" and leaving their mark behind on the public space (Fig. 2). The opportunity gave them a chance to express themselves by playfully triggering and intrinsically motivating them. The concept involves projection mapping and the use of digitally augmented

Fig. 2. "Blackboard" concept

blackboards to create a public art growing system in a city. The goal of the concept is to increase feelings of inclusion and connectedness of the citizens of the city to each other and to the public space they are in.

Aspect 1:
Imagine, a blackboard situated on a building in a city. A person walks by, grabs a piece of chalk and starts drawing or writing on it, leaving their mark. The blackboard projects the drawing or written words of those who left their mark onto the building, in other words augmenting the physical world in a digital way.

Aspect 2:
A more connected aspect was also added to the concept. In some locations the blackboard will be provided with a camera. The feed of this camera will be projected onto a blackboard in another location in the city. If a person walks by this secondary location, they could possibly see someone, a complete stranger, leaving his or her mark on that first blackboard. All of this is carried out using video feed. This creates the result that people see individuals in another location walking by – or sharing on the blackboard of this other location – where the first individual is not actually him or herself.

(a)
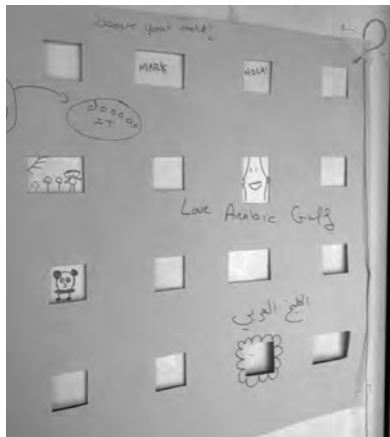
(b)

Fig. 3. Exploration results

4 Explorations

4.1 Exploration 1

The first step into the development of the concept was to see if people would be triggered to share

	Positive	Neutral	Negative	Total
Drawing	27.2%	31.6%	2.6%	61.4%
Text	18.4%	13.2%	7.0%	38.6%
Total	45.6%	44.8%	9.6%	100%

Table 1. Percentage of elements shared

something in a public space or not (H1). An initial exploration was carried out for this purpose. Eight pieces of A0 papers were hung in various spaces at Eindhoven University of Technology (Fig. 3 (a)). Each large paper had 1 or 2 colored markers attached alongside the papers.

As a trigger, each paper also had the words: "Leave your mark, draw, write, do whatever you like". They were left hanging for 1 week on average.

In total 144 things were shared (Table 1). Seventy of these were drawings and 44 were texts. We could speculate from this that people are more inclined to draw than write. This meant that the final concept should be open to both possibilities. 37 of these (32.5%) were on the papers put in the auditorium close to the cafeteria of the auditorium in the university. Partially due to this result, this location would later be chosen for the subsequent tests as it was the most elaborated paper. Daily visits to each location showed that once the high threshold of the first drawing or two was shared, the threshold seemed to be lowered as more people shared in a shorter time span. This indicated that, given time, people would be triggered to participate through the participation of others.

The first paper and pen based exploration showed that people appeared to be triggered by the presence of paper and pens to draw or write something on the sheets of paper hung around campus. Public spaces are constrained by the shapes and forms of the buildings in that space. This was seen as an interesting opportunity to use the final concept to augment the physical space. But if constraints are given, such as paper with cut out shapes, would individuals use them?

4.2 Exploration 2

The same format was used as for the first exploration.

	Using the cut out shape itself				Using the inside of the cut out shape			
	Positive	Neutral	Negative	Total	Positive	Neutral	Negative	Total
Drawing	22.9%	25.7%	0%	48.5%	15.8%	7.2%	0%	22.9%
Text	7.2%	7.2%	1.4%	15.8%	7.2%	5.7%	0%	12.9%
Total	30%	32.9%	1.4%	64.3%	22.8%	12.9%	0%	35.87%
	percent of total			64.3%	percent of total			35.7%
Combined total								70
Combined percentage								100%

Table 2. Elements shared using the outside of the shape or the inside of the shape

8 papers with pens were hung in the same 8 locations. The difference was that these papers had cut out geometric shapes in them (Fig. 3(b)). The idea behind the geometric shapes is that they are representative of the windows and doors of a building.

The total number of shared marks was 70 this time (20 texts and 50 drawings). The number of drawings that ended up using the inside of the cut out shapes was of 45 (35.7%). People's use of the cut out shapes was 25 (64.3%). See Table 2.

This allows for speculation that people can be triggered to use geometric shapes for the use of their drawings and shared content. Though because of the nature of the prototype used in the final experiment, however, individuals will not be able to draw in the holes.

5 Experiment

The cafeteria of the auditorium at the Eindhoven University of Technology was chosen as the location for the experiment. It was the location with the most results during the pen and paper exploration. It is a social interaction location that resembles the squares in cities with restaurants and cafes in interaction, attitude and frame of mind.

Depending on courses and days of the week, it is uncommon for the same group of people to pass through the cafeteria of the auditorium every day. Enough participants and the same profile of them allowed for both between group tests that has less learning effect.

The tests were conducted over lunch hours, between 11.30 AM and 1.45PM on Tuesdays and Fridays. Depending on the tests, the tools used were the paper questionnaires (SCS-R, ICS), the handmade blackboards and chalk (Fig. 1(a)); a projector and a pre-filmed movie of people drawings on the blackboard on a computer (Fig. 4(b)).

5.1 Instruments
Social Connectedness Scale Revised

The Social Connectedness Scale Revised (SCS-R) scale [14] was used. This 20-declaration scale asks people to grade from 1 to 6 depending on whether they

Fig. 4a + 4b. Experiment settings

respectively strongly agree or strongly disagree with the statement made. High internal reliability of the scale at a degree of a=0.86-0.89 across the scale gives us enough confidence in using this scale in the experiment.
Inclusion of Community in Self scale
The pictorial Inclusion of Community in Self (ICS) scale [15] was also used in the experiment. The scale is composed of 6 pictorial representations of two circles (one representing community and the other representing the "self"). Each of the pictorial representations varies from its neighbor by increasing the intersection surface. An increase in this intersection shows a closer sense of inclusion to the city and people in their environment.

Interviews

Interviews were conducted on dates and times that were suitable for the interviewees. Interviewees were either interviewed at their workspace or in the auditorium cafeteria depending on what was more suitable for the interviewees. Interviews lasted an average of thirty minutes and varied from fifteen to forty-five minutes. Ten people in total were interviewed, two from each test. The purpose of the interviews was to gather

valuable, qualitative information that might go unsaid through the self-examinations tests conducted first.

5.2 Participants
100 students participated in the experiment (20 participants for each test). They were from varied ethnic backgrounds and level of education accomplished at the time of the test (Bachelors students, Masters Students, PhD students) and varied in age between 18 and 33. The average age was 22.31. Of the 100 participants, 61 were men and 39 were women.

5.3 Procedure
After each test, they were personally asked to fill in the questionnaire that included the above-mentioned scales. Participants were informed about the purpose of the form. The form requested participants to fill in their personal email address if they agreed to be contacted for further interviewing. No reward of any kind was provided to the test participants.

For every test group, two people would be selected for interviews in order to gather qualitatively useful data, one with a higher score on the Social Connectedness Revised scale and one with a lower final score.

5.4 Data analysis
The results from the scales used in the control tests, test A, B and C (to be described in detail later in this section) were evaluated according to their described methodologies, calculating both scale and item mediums as well as the standard deviations for each. To determine whether the difference in means is statistically significant, a one tailed ANOVA test was conducted. The analysis is a one-way because there are more than 3 groups (tests) with participants that are in no way related to each other aside from visiting the same location. Bonferroni is chosen for these reasons as the post-hoc settings for the one-way ANOVA test. Bonferroni' test is also suitable when small numbers of pairwise comparisons are being analyzed.

5.5 Test settings and conditions
Two control tests
Two control tests were conducted. These control tests were carried out in order to have a valid baseline with respect to the level of inclusion and connectedness within the campus in the cafeteria of the auditorium during lunchtime. This allowed for a comparable control

context for the results of the follow up data. The control tests were conducted on Tuesday May 14th 2013 and Friday May 18th 2013. The 20 participating people were asked to only fill in the same questionnaire that included the SCR-scale and the ICS-scale.

Test A
Test A was conducted on May 22th 2013. Two blackboards were placed on opposite sides of the vending machine close to the tunnel leading to the main building of the cafeteria of the auditorium (Fig. 5).

Fig. 5. Test A setting

Both blackboards were identical and were provided with colored chalk. The words "Leave your mark" were printed and hung above the blackboards. People who chose to come and share something were asked to fill in the same questionnaire that the individuals in the control test had filled in. Because most participants ended up only seeing and experiencing one of the two blackboards, the second one was found to be excessive for subsequent tests.

Fig. 6. Test B setting

Test B

Test B setting is similar to Test A, but with an added digital aspect. It was conducted on Tuesday the 28th of May 2013. A previously filmed 2-hour footage of people occasionally coming to draw something was projected on the board (Fig. 6). People who chose to come and share something were asked to fill in the same questionnaire that the individuals in the control test and test A filled in.

Fig. 7. Test C setting

Test C

The final test was carried out on Friday the 31rst of May 2013. Similar to test B, a projector was used once more in this setting. In this test, however, hints to the use of the geometric shapes were projected. That is, how people could use the shapes to incorporate them into their drawings instead of drawing around them (Fig. 7).

This test would show whether or not it would be necessary, or even useful, to have this constraint of geometric shapes based on the public space in the final real life version of the concept. As already stated the geometric shapes are representative of windows and doors of a building. This final test was thus to fine-tune the concept and to see if people would use these shapes or not.

Fig. 8. (a) Using the shape as basis; (b) Using the shape as inspiration

5.6 Results

Observations about the use of the geometric shapes

In test A, 2 people used the geometric shapes as basis or inspiration for their drawings. In test B, 6 people used the geometric shapes as basis or inspiration for their drawings. In test C, 15 people used the geometric shapes as basis or inspiration for their drawings. Examples are shown in Fig. 8.

Social Connectedness Scale Revised

There was no statistical significance between the two control tests. This shows the reliability of the scale used in the context. Consequently, the results of the two control tests were merged into one.

The mean result for the control test was 54.90 with a standard deviation of 7.78 and a standard error of 1.23. This compared to the total mean of test A that was of 60.40 with a standard deviation of 6.35 and a standard error of 1.42. The mean result for the test B on the SCR scale was 68.75. The standard deviation is 6.53. There is a standard error of 1.46. Test C had an average of 60.75 with a standard deviation of 7.29 and an error margin of 1.63.

			Mean Difference	Std. Error	Sig.
sum_score	control test	test A	-5,50000	1,96689	,037
		test B	-13,85000	1,96689	,000
		test C	-5,85000	1,96689	,022
	test A	control test	5,50000	1,96689	,037
		test B	-8,35000	2,27117	,002
		test C	-,35000	2,27117	1.000
	test B	control test	13,85000	1,96689	,000
		test A	8,35000	2,27117	,002
		test C	8,00000	2,27117	,004
	test C	control test	5,85000	1,96689	,022
		test A	,35000	2,27117	1.000

Table 3. Bonferroni SPSS results of the SCS-R scale across the tests

The statistical significant variances between the control tests, test A, B and C (Table 3) show a significant improvement in SCS-R scores (p=0.037, 0.000, 0.022 respectively). The result also shows significant increase in SCS-R scores of B over A (p = 0.002) and B over C (p=0.002). There is no significant difference found between A and C.

Inclusion of Community in Self scale

The data of the control test was a mean of 3.90 with a standard deviation of 0.84 and a standard error margin of 0.13. Test A had a mean of 4.50 with a standard deviation of 0.60 and a standard error margin of 0.14. For test B, the mean was of 4.85 with a standard

(I) test condition	(J) test condition	Mean Difference (I-J)	Std. Error	Sig.	95% ... Lower Bound
control test	test A	-,60000	,20935	,031	-1,1640
	test B	-,95000	,20935	,000	-1,5140
	test C	-,65000	,20935	,015	-1,2140
test A	control test	,60000	,20935	,031	,0360
	test B	-,35000	,24174	,906	-1,0013
	test C	-,05000	,24174	1,000	-,7013
test B	control test	,95000	,20935	,000	,3860
	test A	,35000	,24174	,906	-,3013
	test C	,30000	,24174	1,000	-,3513
test C	control test	,65000	,20935	,015	,0860
	test A	,05000	,24174	1,000	-,6013
	test B	-,30000	,24174	1,000	-,9513

Table 4. Bonferroni SPSS results of the ICS scale across the tests

test A, 2 people using the shapes

test B, 6 people using the shapes

test C, 15 people using the shapes

Fig. 9. Number of people using the shapes for their drawings per test

deviation of 0.67 and a standard error margin of 0.15. Test C had an average of 4.55 with a standard deviation of 0.83 and a standard Error of 0.18.

Based on the one-way ANOVA calculation conducted through SPSS the statistical significance of this variation in mean between the control tests and the other tests (A, B and C was significant (p=0.031 0.000, 0.015 respectively).

When looking at the scores in the ICS scale of B over A, B over C, and A over C, there was no significant difference found.

6 Discussion

The study presented is exploratory and aimed at answering the research question which emerged during the early project phase. The research question was decomposed into smaller ones with which the hypotheses were set.

The tests were conducted in a more controlled manner in a smaller environment than the city that the concept is aimed at. It should be stated that the validity of the tests is limited by the experimental environment. The following discussions are based on the assumption that the results concluded from these experiments would be also valid for the city environment.

6.1 Use of geometric shapes

H2: People will not use the geometric shapes for their forms of expression.
The results of both the second experiment and of the final experiment show that when there was no real hint to use the geometric shapes a few individuals did use them as basis or inspiration for their drawings. Ba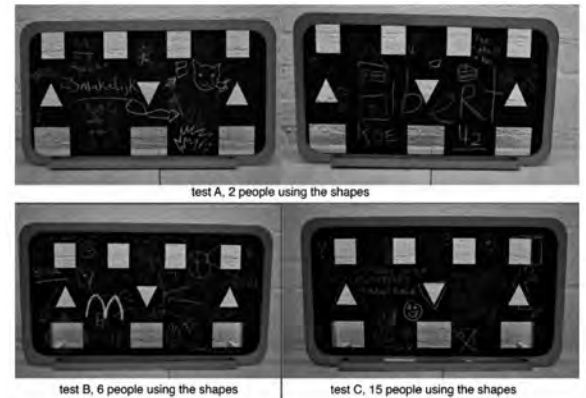sed on only these observations, hypothesis 2 cannot be fully rejected. This is because, without hints, even though people used the shapes, only very few people did so.

H3: People will not use the geometric shapes for their forms of expression when hints to this option are given.
For test C, there was a hint projected on the black-boards for people. In this case more individuals used the geometric shapes as inspiration or for part of their drawings in test C than when compared to tests A and B. In the case of test B more than double the number of people did so and, when compared to test A (Fig. 9).

Observing the statistical analysis based on SCS-R and ICS when comparing test C to A and B, one may conclude that providing hints on drawing along the geometric shapes does not contribute to the participants' feeling of social connectedness and inclusion. In Fig. 9, however, it is also evident that the participants did follow the hints and geometric shapes that were taken into account by others when interacting with the blackboard.

When looking at the proportions, it can be inferred that H3 is negated as more people did end up using these shapes. Based on these conditions, it can be stated that there is a relevance to keeping the use of the geometric shapes in the final version of the concept.

H4: Even when giving people hints to the possibility of using geometric shapes, their sense of connectedness is not different from when only using a plain blackboard with nothing added.
Based on the results of test A over C for the SCS-R scale, it can be supposed that adding the hint only adds

to people using the geometric shapes as stated earlier in this discussion but not the feeling of connectedness. In other words, it appears that the individuals in test C and A share a similar sense of connectedness and inclusion. This can mean that H4 can be accepted.

6.2 SCS-R scale

When comparing the mean of the tests, it appears that there is a strong sense of connectedness increase when comparing the control test to the other tests.

The results show a significant statistical difference between the control test and test A. This could mean that people had a higher sense of connectedness in the space with other people in the same space because of the presence of the blackboard and their interaction with it. The similar significant difference is also found when comparing Test B and Test C to the control test.

As the Hawthorne effect [16] suggests, any interference or change to an environment of the participant that gets their common attention will have an impact on their feeling of connectedness. We have to agree that it is not entirely clear whether it was the design of the blackboard that made a difference. Test A, however, shows that a difference can be made; moreover it is used as a reference for test B and C in which we pay more attention to digital augmentation. We may also have the similar discussions when comparing Test B and C to the control test.

H5: People's sense of connectedness to the space - and to others in the same space - will not be increased by letting them express themselves in a designed way with the blackboard in the public space.
The results from the various tests SCS-R numbers contradict H5. It can be interpreted to mean that the H5 is voided by these results, seemingly showing that there is an increase in the feeling of connectedness of people when letting them express themselves in a public space. This finding led the researcher to ponder whether there are differences in the results that are significant between test A, B and C.

Between A and B: B appears to have a significant difference over A. Interacting with other people in real time with digital augmentation seems to have a strong impact on social connectedness.

Between B and C: The significant difference for B over C shows that interacting with other people in real time with digital augmentation has a stronger effect than when digital augmentation is only about the hints regarding geometric shapes.

H6: Projecting a feed from one blackboard on another, allowing people to see other's drawing, etc. will not influence their sense of connectedness.
When comparing B to A and B to C, the results allow speculation that H6 can be rejected. The influence of the added digital feed seems to have had a very big influence on people's feeling of connectedness. This result also confirms the result from other studies [3]. This aspect was further explored more closely in the interviews.

The results show that there is no significant difference between A and C. It would seem that the digital augmentation does not have an influence on the feeling of social connectedness. This suggests that, in these cases, the physical interaction with the environment can be replaced with well-designed digital interaction, without harming the participants' feeling of social connectedness.
One could suggest that this lack of difference between tests A to C as opposed to the presence of the difference between the control test and the other tests is due to the Hawthorne effect [16]. This aspect would need to be examined more closely in a future experiment.

6.3 ICS scale
H7: Letting people express themselves in a controlled manner with the designed blackboard in the public space will not influence people's sense of inclusion.
When comparing test A, B and C to the results of the control test, the participants in these tests appear to have felt more included in the community than those in the control tests. This means that H7 can be, statistically speaking, disproven. It can thus be postulated that through the act of participating in the test in any way, even just by leaving their mark, people felt an increase in their sense of inclusion in the community.

H8: Projecting a feed from one blackboard to another, allowing people to see others' drawing will have no influence on their feeling of inclusion.

When comparing the results of test A to those of test B, the difference is not significant. The same applies for the results of test A and C. Furthermore, this equally applies for the comparison of test B and C. This shows that H8 was not rejected.

Due to the difference present in the SCS-R scale but lacking in the results of ICS scale, it could be suspected that the sensibility and validity of the ICS scale could be brought into question as a tool set for such tests.

6.4 Interviews

When asked to describe a moment where they felt particularly included, 9 out of the 10 people interviewed described stories where they got to know strangers due to either unexpected events (for example in the Netherlands, something going wrong with a train) or due to the setting (for instance a festival). From this information it would appear that the event of connecting to people one did not know beforehand really influences their feelings of inclusion.

In the cases where someone else had expanded the drawing of the interviewee, responses were strong and similar. As one person said, "I like it! I like the shape! It means, I feel like I made something for someone. I wanted to keep going, I was being helpful to someone else." People felt they helped each other and like they became part of the systems by collaborating.

When people saw others draw, both in real and with projected ones, the responses were as follows: "In a way we were making something together. If they were drawing on the same board at the same time it influenced me more. We were doing it together and not by myself. I felt like we were drawing together." "When I drew I saw cat whiskers already drawn on the board. They were inviting and felt open to me. I also saw a smiley... I felt open and happy, the drawings made me laugh. I drew something and it was funny because suddenly a persona appeared on the beamer and started drawing something similar to my drawing. That made me feel happy." The existing drawing influenced people by apparently lowering the threshold and inviting others to participate. They stated that they felt happy when seeing others draw.

When asked how they felt seeing their drawing having become part of a system the response of the 6 non-

control group interviewees were all similar as well: "As I said I felt like part of the blackboard system. I did not feel excluded. We seemed to really be working together to create something even though we did not know each other. " This was a sentiment echoed by all.

Participants in the interviews from test A and C said that they felt more included when other people had extended their own drawings. The revisiting fact, or seeing the final results from the test, influenced how people felt afterwards. Here it can be asked whether seeing one's work elaborated on during the next visit to the public space influences the feeling of inclusion. It could also be interesting to explore whether the beamed feed of other people drawing – or if the extensions of a drawing by others – is influential on people feelings of inclusion.

Intrinsic motivations are founded in our innate human nature. Our ingrained features push humans to be driven by curiosity and to participate in social activities [12]. It became apparent through the participants' reactions in the interviews that they were triggered by their curiosity and their natural intrinsic motivation to participate in this social activity. One individual, for example, stated, "I was thinking of what everyone else put on the blackboard. (What they wrote or drew). I looked at how what I left would compare to what others put. It influenced the colors and size and location I chose. But it didn't influence what I drew. I liked it."

7 Conclusions

The beauty of the concept "Leave your mark" lies in its simplicity and the ease for people to step in and out creating a reasonably low threshold. It seems to be an appropriate solution to design a public art installation with digital augmentation to the physical world to increase people feeling of inclusion and connectedness.

In this specific case we can speculate from the answers that the presence of a prototype of the concept influenced people's sense of connectedness and inclusion. The lack of difference found between tests A, B and C in the ICS scale is unlikely to be caused by the Hawthorne effect. This is a point that should be explored further. Specifically as it related to the results of the Inclusion of Community in Self scale where no

significant differences were found between the tests. Seeing there was such a significant difference in the SCS_R scale, which was lacking in the ICS scale, this could bring into question the validity and effectiveness of the ICS scale or it is simply because the social connectedness and inclusion are not coupled concepts.

The results of the Social Connectedness Revised scale however were more noticeable. Using the designed concept "Leave your mark" as a form of public art system could help citizens of that city feel more connected. It can be concluded that when there was the added digital feed of other people drawings, people felt a much higher sense of connectedness. This was also confirmed by the results of the interviews.

Given that this was an exploratory test conducted in controlled settings away from the real final set up, there are limitations with regard to the results. It is important to note that this test should be conducted again with a real setup in a public space. This is necessary to determine if the results will coincide with those found here. This exploratory research project could be seen as an interesting start to inspire future work and explorations in public digital art installations with digital augmentation to public spaces in cities.

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