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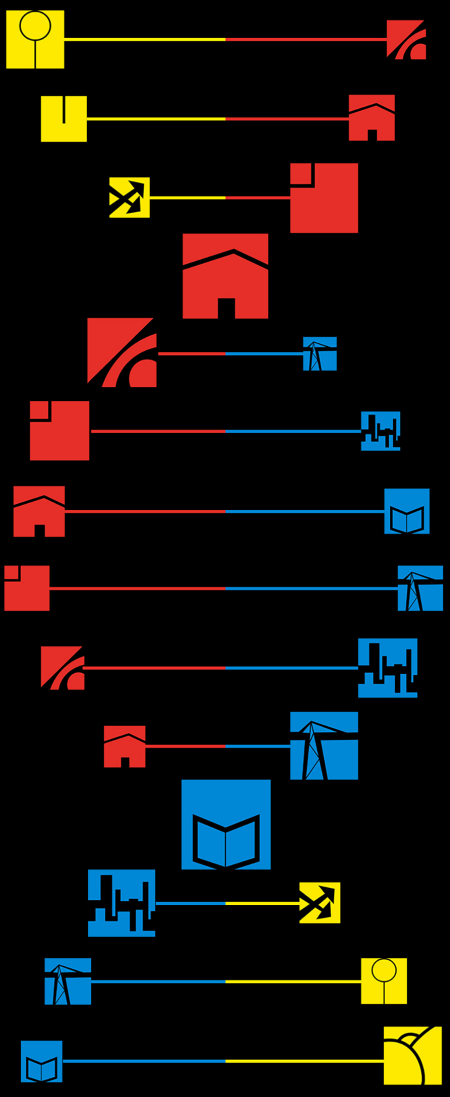

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September 27-29 2023 Trabzon TÜRKİYE

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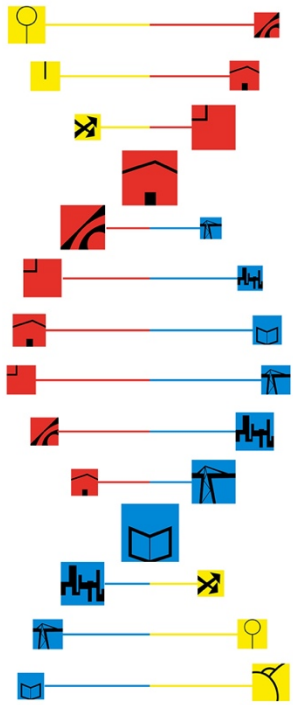

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POTENTIALS AND LIMITATIONS OF SITUATED POLLS FOR CITIZEN FEEDBACK IN PUBLIC SPACE: A MICRO CASE IN BESIKTAS

Araf Öykü TÜRKEN

[1] *Yildiz Technical University, Faculty of Architecture, Department of Urban and Regional Planning, Istanbul, Turkey, aturken@yildiz.edu.tr*

ABSTRACT

Rapid technological developments have enabled simultaneous existence in the physical & cyberspace and restructured daily life dynamics. Accordingly, new needs for urban systems have emerged, and the use of technology in urban space has increased for different purposes. In that sense, the networked mechanism positioned in public spaces such as urban screens, interactive dashboards, media facades, and cyber-physical systems has begun to revive socio-spatial dynamics, support functional engagement, or collect data from the city. However, there is relatively limited research and practice on how these devices can contribute to participatory planning and design processes, especially in Turkey. Within the scope of the research, the potential and limits of the situated devices in the urban space and related implementations to contribute to participatory processes are examined. In this context, relevant literature and different practices in various countries have been reviewed, and a polling prototype is situated in an urban green space in Beşiktaş (Istanbul, Turkey) to understand the local reflections. The prototype has simple yes/no questions about green space and a QR directing to the online survey for deep feedback. As a result of the research, it has been determined through relevant literature that low-cost technologies added to the elements in urban space can support citizen feedback within limitations; also, in micro case, security issues and user-based data manipulation rendered the data unreliable, so different kind of practices must be tested for better performance and measures should be taken to prevent this situation. Furthermore, situated poll devices can also have micro-effects on spatial mobility and trigger people's follow-up interactions and actions, as seen both in the literature and this case. The prototype's location, size, and way of attracting users are highlighted as critical issues, and it is detected that approaches requiring additional devices are relatively less preferred, security issues may prevent the long-term positioning of devices, and data manipulation issues can affect the accuracy of results.

Keywords : urban interfaces; situated polls; public space; human behavior.

INTRODUCTION

Ubiquitous computing has developed and influenced daily life patterns and usage of smartphones and wearable devices has affected human movement and behavior patterns in urban space in contexts such as speed, attention, and interaction, etc. (Appel et al., 2019; Argin et al., 2020; Chen et al., 2018; Humphreys & Hardeman, 2020). Relatedly, new needs for urban systems have emerged, and the use of technology in urban space has diversified with various purposes, especially control, automation, and real-time data (Salim & Haque, 2015). Accordingly, the digitization of urban services has accelerated and experts have revealed new ideas and interventions to provide users with various hybrid experiences [interactive projections, QR codes, smart urban furniture.. (Argin et al., 2020)]. Some of these approaches have created the opportunity for users to establish a new type of relationship with the urban environment (Salim & Haque, 2015) beyond making the physical space smarter. In that sense, the networked mechanism positioned in public spaces such as urban screens, interactive dashboards, media facades, and cyber-physical systems has begun to be used for purposes such as reviving socio-spatial dynamics in the public space, supporting functional engagement, and simultaneously collecting data from the city. Studies that deal with providing interaction between user-object-space to receive citizen feedback and mainly contribute to participatory planning/design processes are relatively limited. Although examples are few yet, existing ones have shown that it is possible to collect feedback/problems/ideas from individuals (Coenen et al., 2019; Hespanhol et al., 2015a; Hespanhol & Tomitsch, 2019; Liu et al., 2019). Even with the low-budget prototypes, such practices contribute to early participatory processes and trigger group interaction. The obtained data from these interventions can contribute to the relevant spatial production processes by urban authorities, planners, and architects (Salim & Haque, 2015) and support user-oriented regeneration by capturing citizens' opinions. Also, they can simultaneously strengthen the culture of participation and revitalize the public space.

Within the scope of this research, the potential and limitations of situated voting devices in public spaces in terms of contribution to gathering citizen feedback related to urban issues are examined. In that sense, this research is limited to low-cost situated polls in public space considering local dynamics via a micro experiment since local implementations and user behavior matter in terms of culture, familiarity, and usage. Therefore, the questions listed below are sought to be answered and discussed regarding local potential and limits

RQ1: What are the potentials and limitations of situated public polling in urban space regarding their influence on the participatory process, spatial dynamics, and human behavior?

RQ2: What are the local reflections and interaction dynamics between people and public situated polling prototype considering the micro case in Beşiktaş, Istanbul-Turkey?

METHODOLOGY

This research is in the intersection of interaction design, community participation, and participatory urbanism practices and considers public polling experiments with situated devices in public space. In this context, technologies and devices are tools to restructure participation by supporting traditional processes, their usage patterns and intervention type directly affect the micro-mobility and human interactions in the space, and their taxonomy differs in terms of their contribution to public engagement, as mentioned in Liu et al., (2019, p. 204). Within the scope of this research, related literature and different practices in various countries have been examined, such as Vote as you go (Hespanhol et al., 2015a); Poster-Vote (Vlachokyriakos et al., 2014), Myposition (Valkanova et al., 2014), Data on site(Claes et al., 2018); Vote with your feet (Steinberger et al., 2014). How these practices affect participatory process and human behavior has been detailed. During these examinations, the following parameters are used: location choice, technical aspects, interactive approach, and participation level, behavioral attitudes.

With learning from examples, a polling prototype is designed that contains a low-cost and flexible system detailed in the following sub-section. It is situated in the urban green space in Beşiktaş (Istanbul, Turkey), to understand the local reflections and interaction dynamics as interest and familiarity level can vary in the context of culture, place, and user and directly affect interaction. There is a short yes/no question about green space usage (which can be marked with buttons) and a QR directing to the online survey on the prototype. The device is situated for a weekday and Sunday related to the crowd dynamics in green spaces approximately two and half hours. Via observation, the changing behaviors of the users, awareness, interaction with the mechanism, types of actions, and relationalities are examined. During the observation period, the observer stood at a reasonable distance, took notes simultaneously and systematically with the naked eye, and did not participate in the interactions, based on diary tool for observation purposes (Gehl & Svarre, 2013).

As some limitations of the observation process, relations between group behaviors and the screen could not be analyzed precisely due to the observer distance. Also, human observers can assess data accuracy in pedestrian flow counts less, ranging from 8% to 25%, depending on the observer, as mentioned in Bauer et al. (2009).

Details about situated polling device that used in micro case

The initial test in this research was conducted with a polling object that contains a paper draft and simple counters. During this test, all systems are worked mechanically and manually. After this, it was decided to create a low-cost technology prototype. The prototype includes an Arduino UNO, two buttons, and an LCD screen, and it works with an external battery. Arduino is an open-source- micro-electronic kit (Salim & Haque, 2015, p. 7) and a low-cost device for creating electronic projects. Relevant code for implementation has been written with the support of OpenAI (2023) and uploaded to the device with Arduino, (2023) software. A digital version of the prototype first tested via Tinkercad (2023) simulations, then physically is implemented with a designed box located in a public space and observed.

As a main limitation of this device, this prototype is worked individually, and votes are displayed on the small screen as text. However, in further research, relevant prototypes can be improved to allow data exchange with time stamps over the internet through additional modules that can be added to the Arduino system, and with different screens, data can be visualized as graphs to provide a better experience.

CONCEPTUAL FRAMEWORK

Physically Located Citizen Feedback Mechanisms in Urban Space

Integration of physically located technological devices into the citizen empowerment process has gained importance, particularly within city models such as smart cities and digital cities (Clarinval et al., 2021). In this context, public polling displays, situated voting devices are interactive ways to local spatial data gathering (Coenen et al., 2021). These practices can support overcoming some limitations in participation or e-participation process: such as lack of time & technical skills (Coenen et al., 2021), lower participation barrier(Steinberger et al., 2014, p. 44) and have the potential to involve a larger population in the consultation process comparing focus groups or online questionnaires (Parker et al., 2015). These kinds of applications have been explored under various names by experts, such as situating digital polling interfaces (Hespanhol & Tomitsch, 2019), situated voting devices (Taylor et al., 2012), public polling displays (Coenen et al., 2021), public interactive polls (Valkanova

et al., 2014), local community polling (Steinberger et al., 2014), public visualization integrated with polling systems (Claes et al., 2018). These polls can be implemented physically in public spaces via public screens (Hespanhol et al., 2015a), objects with the internet of Things (IoT), and different plug-in interfaces (Hespanhol & Tomitsch, 2019) etc. They can be conducted via various institutions such as research labs, governmental bodies, municipalities, living labs or NGOs, with data gathering, post-occupancy evaluations (POE), or citizen feedback purposes, etc., generally as temporary installations. They can capture the attention of passers-by in urban spaces and allow them to give feedback on relevant urban issues (Baldauf et al., 2014; Parker et al., 2015) in a less time-consuming way, depending on the attractiveness of the device/tools or interaction environment. To achieve this, voting devices generally use simple buttons, body movements or gestures to mark ideas/opinions, but after the pandemic, we also see "foot pedal" linking to devices (Coenen et al., 2021). Additionally, there are other voting techniques, such as QR interactions with mobile phones, remote approaches (Baldauf et al., 2014), or even augmented reality-based practices(Parker et al., 2015). Besides these advantages, the experiments designed with these kinds of devices must consider privacy concerns(Baldauf et al., 2014; Parker et al., 2015), and user barriers such as the lack of user-friendliness of interface (Parker et al., 2015), social embarrassment issues, or resistance to participate (Brignull & Rogers, 2003), and so on. Relatedly, Hespanhol & Tomitsch (2019) have mentioned that "technological familiarity, level of integration with built environment and pedestrian activity" can come fore as contextual handicaps (p.26).

Different dimensions of situated public polling systems

Situated public polling interfaces are accepted as a tool for supporting citizen feedback mechanism that is also related to citizen engagement and participation process within the scope of this research. In that sense, the impact of these practices through (a) participatory, (b) spatial and (c) behavioral aspects are highlighted and interpreted with experts' approaches in this section.

a) Participatory Dimensions: In Clarinval et al. (2021)'s study focusing on public polling displays and participation-related urban issues, they have mentioned that even though the technological characteristics of these practices have been discussed in the literature, their participatory dimension and involvement issues relatively less come to the agenda. In terms of participation levels, these practices -with public display- are mostly performed on a consultation level via multiple choice questions, yes-no answers or scale-based approaches (Clarinval et al., 2021).

Accordingly, since practical data exchange is similar it can be said that public polling practices even with different technology function similarly in terms of participatory aspects. Furthermore, Liu et al. 2019) have highlighted the ability of the Internet of Things (IoT) for social aspects. They categorize the taxonomy of public engagement with IoT through headlines "triggering social interactions, raising awareness, inviting citizen participation (gathering public opinion, public data visualizations, scaling up citizen engagement), building communities, and addressing matters of concern"(Liu et al., 2019, p. 187).

b) Spatial Dimensions: Different strategies based on context, purpose, display visibility or interaction purposes are applied regarding the location selection of related devices. For instance, the study conducted by Hespanhol & Tomitsch (2019) elaborates on plug-in interfaces, pedestrian crossings, pedestrianized areas and thoroughfares selected by considering waiting time activities and flows. Valkanova et al. (2014)' study aims to attract passers-by and avoid accidental voting, so they prefer to implement their experiments in front of some facilities such as cafes, shops, or entrance halls.

Further to that, space is an essential parameter in terms of interaction, considering relations between users, devices, and other people in their impact zone. Fischer & Hornecker (2012) define physical space and interactive display relations using terms like "display spaces, interaction space, potential interaction space, social interaction space, and activation space". Even though they have used these terms for media facades, and this research considers only public polling practices, which can be more small-size interventions, it is possible to say that some of the interaction spaces clarified with these terms show similarity. For instance, display spaces refer to places where intervention can be seen. It is also an issue for polling devices, especially in capturing pedestrians' attention; interaction space, in our research, is more likely to refer to space where pedestrians realize and come closer to the device and vote. Furthermore, Behrens et al., (2015, pp. 61–63) have discussed different "socio-spatial frameworks" related to interaction spaces, also considering Fischer & Hornecker (2012)'s, Michelis & Müller (2011)'s and Brignull & Rogers (2003)'s studies. Even though the performative side of polling devices may not be as strong as media façades, large displays or interactive installations, in every time; in principle, awareness places that handle focal awareness or direct awareness are a critical issue as a first step in using the situated device. Also, regarding "action space," some roles and phases can be observed in interaction with polling displays too, such as passer-by, viewing and reacting, direct interaction etc.

c) Behavioral Dimension: Experiments that aim to understand the impact of public polling displays frequently use observation to analyse human behaviours (Baldauf et al., 2014; Claes et al., 2018; Coenen et al., 2019). In that manner, Baldauf et al. (2014) have described that polling interface has triggered some behavioural attitudes during observations with their prototype, such as people passing the screen noticing the device and tending to interact with it or return even when they have passed by, showing interest in the device during their waiting time, or encouraging other people to vote etc. Similarly, various behaviours have been identified in different pilot studies that offer interaction-oriented interfaces, although they do not adopt polling directly. For instance, Brignull & Rogers (2003) have called the "honey-pot effect" that people's interest in display creates a sociable area that may invite others.

Examination of Public Polling Practices in Urban Space



Figure 1 (a) Vote as you go (Hespanhol et al., 2015b), (b) PosterVote (Vlachokyriakos et al., 2014), (c) Myposition (Valkanova et al., 2014), (d) Data on site (Claes et al., 2018), (e) Vote with your feet (Steinberger et al., 2014)

This section details five different situated poll practices in urban spaces (Figure 1). In order; "Vote as you go" is an outdoor experiment that contains different situated practices. The first practice is a web-based survey on iPad visualized through an urban screen, and the second is a full-body voting application on an urban screen that allows people to vote via movement (Hespanhol et al., 2015b). PosterVote is a voting system that include low-cost electronics and paper posters with LEDs and buttons, and designed to be accessible and easy to participate (Vlachokyriakos et al., 2014). It can be implemented on any surface and supports bottom-up approaches, triggering social interactions. However, it can not provide immediate feedback about results, and it is considered a limitation. This can be solved through additional public displays or media façade as mentioned in Hespanhol et al. (2015b); additionally, first, case results show that multiple voting could be an issue that can affect data accuracy (Vlachokyriakos et al., 2014). My position

is an interactive installation that aims to make it easy to mark individuals' opinions on local subjects and compare them. It has large projections and contains data visualizations that capture the attention both indoor and outdoor (Valkanova et al., 2014). "Data on-site" is a polling and visualization system that is wirelessly networked and contains small size and spatially distributed displays that support real-time data collection (Claes et al., 2018). Moreover, "Vote with your feet" is a polling tool in public space that allows users to vote about local issues or civic discourses via stepping buttons on the ground. It is located at the bus stop and catches the attraction of passersby or waiting people(Steinberger et al., 2014). More detailed information on the examples can be accessed from the Table 1.

Table 1. Examination of Different Practices

	Vote as you go	Poster-Vote	Myposition	"Data on site" system	Vote with your feet
Sources:	(Hespanhol et al., 2015a; Liu et al., 2019)	(Liu et al., 2019; Vlachokyriakos et al., 2014)	(Valkanova et al., 2014)	(Claes et al., 2018)	(Steinberger et al., 2014)
Location choice of some of the cases	a public space in Sydney, Australia	implemented in two local communities	transit area in Berlin	displays positioned in neighbourhoods	In a bus stop in Brisbane
Technical aspects	(1) Large urban screen, surveillance camera, tracking with computer vision+ (2) iPad screen with web-based survey	Low-cost electronic system, buttons, LEDs	Public display in the form of a large projection (5x2 m), two Kinect cameras	Electronics, web-based content management system, displays, a radio to enable wireless networking capabilities	Urban screen, tangible buttons
Question type	Yes/No Multiple questions	Multiple question in multiple poster, multiple answer	Multiple answer questions	Multiple question in small-scale multiple displays and answers	Yes/No Multiple questions
Interaction Process	People can vote on an iPad screen more privately. Full-body voting is a playful process that allows voting with body movements.	People mark their opinions on paper poster via button, and LED turn on to indicate.	It adopts a full-body interaction method; people can vote by positioning themselves in front of options.	People can vote with push buttons representing emotion icons like happy, sad, etc.	People mark their opinions via stepping
Participatory Approach	Inviting to participation-gathering opinion + visualization	Inviting to participation-gathering public opinion	Inviting to participation-gathering opinion + visualization	Inviting to participation-gathering opinion + visualization	Inviting to participation-gathering public opinion + visualization

Detected Behavioral Attitudes	Interaction may differ in different time periods, and full-body voting applications capture more attention, especially for young people.	It triggered social interactions in festivals between people (Case 2).	Attracted passers-by, trigger social behaviours	Encourages passerby to reflect on local issues, and support collective engagement of locals.	Triggered social interaction and catch attention of different age groups.

MICRO CASE STUDY IN BESIKTAS

About Prototype and Location Selection

World Peace Park is a public space on Ihlamurdere Street in Beşiktas/Istanbul (Figure 2). The park has a central meeting area where various local performances (dance groups, music, etc.) can be held, green areas and walking routes, a bird feeding zone, a children's playground, two leash-free dog parks, a Cem House, and a small cafeteria. During the field observations, it was realized that the park is preferred by many dog owners for daily walking routines compared to the neighboring parks. Although there are two off-leash dog play areas, the presence of bird feeding areas and unsterilized usage of it, as well as uncontrolled use of children on bikes, scooters, and motorcycles, are the issues that may prevent the park from being truly dog-friendly.



Figure 2. Views from World Peace Park (Besiktas-Istanbul)

In this direction, a situated polling prototype is prepared based on the conceptual framework, and it is positioned to understand the reaction of the local people on this issue and to collect their opinions. The central system prepared with Arduino was mounted into a 30X30 wooden frame (Figure 3). A visual has been prepared and integrated with this frame so that the users of the area can recognize the poll question and in-depth survey guidance. Accordingly, this prototype has a main yes/no question: "Do you consider the World Peace Park as a dog-friendly environment?". Also, through QR, the frequency of individuals' use of the area, their purpose of use, feedback on the pet-friendliness of the park

in the spatial context, and suggestions for increasing the pet-friendly character of the park were collected. The prototype was positioned on the off-leash area's fences beside the walking path, aiming to capture the attention of both dog owners and pedestrians. Since the same pet owners regularly use these areas, they are tested near different entrance gates to reach all user groups.

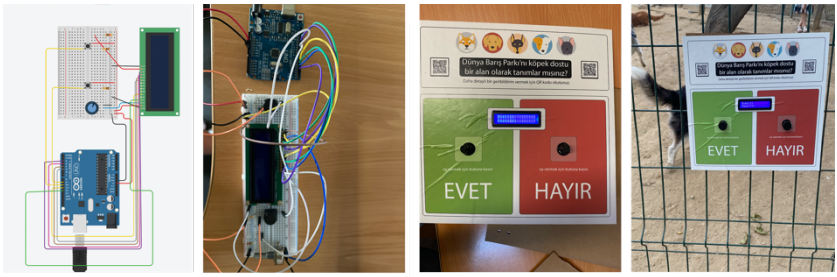

Figure 3. Preparation of the prototype

Observation Process

The observation process was carried out in two phases; the first phase consisted of a pilot study with a draft box (midday/weekend). The second phase deals with the micro case study and the prototype, which is the main subject of this research, and includes an observation period of approximately 2 hours a day on Sunday [weekend (A1)] and Monday [weekday (A2)] to find out different crowd dynamics relations. The time interval was chosen to cover sunset to understand the device's daylight and evening interactions.



Figure 4 Early draft of the voting system with simple counters

A pilot study with paper draft and simple counter: In the early phase of the study, a draft box (12x20 cm) was prepared with two simple counters positioned in the same park and observed. In this pilot process, five

people interacted visually with the draft, and three of these interactions ended up voting, but none of the users chose to interact with the QR for deep feedback (Figure 4). Assuming that the interaction would continue, the device was left in the public space. When the area was revisited the following day for control purposes, it was seen that the device had been vandalized.

Micro case study with situated poll device / weekend (A1): During this process, the total number of pedestrians in the area was 82. Fifty-four pedestrians (66%) did not recognize the prototype when they passed through the area. Twenty-eight pedestrians were aware of the prototype, but only 12 (15%) preferred to vote, and 16 did not vote despite visually noticing the prototype. Only two people read the QR and gave in-depth opinions. The "honey pot effect" was observed in the process, so interacting users encouraged others. In parallel with this, two individuals took photos as a follow-up action. On the other hand, during this group behavior, it was detected that some individuals manipulated the poll data for their views by pressing the button multiple times. Even if the number of people who vote is 12, the LCD screen shows counting as "10-yes / 22 no "because of user-based data manipulation.



Figure 5 Views from the observation process of prototype

Micro case study with situated poll device / week day (A2): The number of pedestrians using the area where the device is positioned during the observation process is 60. Forty-three pedestrians (72%) passed through the area without noticing the device. Although ten people noticed the device visually, they preferred not to vote, and seven people voted. Despite scanning the QR code, one individual did not participate in the in-depth feedback survey. Among the voters, two individuals engaged with the device aggressively, repeatedly pressing the button more than ten times to manipulate the data. Following this, a teenager who had

previously completed the voting process continued the manipulation by playing with the device buttons.

Findings from Micro-Case Study

Compared with the pilot study, it is seen that increasing the size of the prototype and addition of the screen raised the number of interactions. The screen light is determined to increase recognisability, especially in evening conditions. In parallel with the literature, it is observed that interacting people motivated others to interact. The participation rate in the poll is in the range of 12-15% in overall. Almost one out of every three people voted or at least visually realized the prototype's existence (Figure 6). On the other hand, despite the promising situation in interaction rates, the security problem in the pilot study and user-based data manipulation in the main observations prevent the integration of such an application into participation processes without data check. Relatedly, in Vlachokyriakos et al. (2014)'study, it is also mentioned that multiple voting can affect perceived reliability. This issue has also occurred differently in other cases. For instance, in Smart Citizen Sentiment Dashboard practice comes fore as playful interaction with media façade, knob and smartcards; in this practice, also users perform conflicting multiple votes for different reasons (Behrens et al., 2014), but it can be detected through data entrance stamps with the same card. With some security concerns, "Vote with your feet" practices used vandal-resistant urban screen and added the question "Do you answer these questions honestly?' at the end of the poll to ask users (Steinberger et al., 2014)".

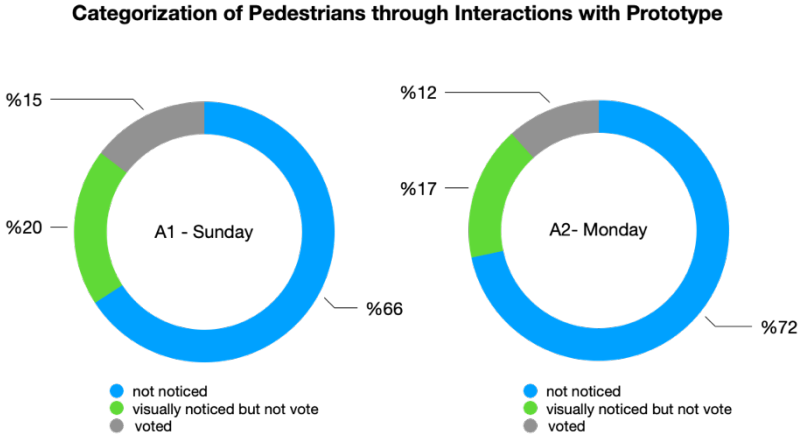

Figure 6 Pedestrian interaction categories

CONCLUSION

As a result of the research, it has been determined that low-cost technologies added to the elements in urban space can support citizen feedback within limitations, have micro-effects on spatial mobility and trigger people's interactions. The prototype's location selection and attracting users are highlighted as critical issues. Moreover, approaches requiring additional devices are less preferred than basic yes/no question voting, and security issues may prevent the long-term positioning of devices. Security concerns and data manipulation have been identified as one of the most critical issues in this text. Since the prototype used in this research works individually and is not connected to the net, manipulations could be detected manually during observation. In general, such a conflicting voting situation would require data checks through time stamps.

On the other hand, it may not be possible to predict interactions that will take place on different devices and in different public spaces as mentioned in Coenen et al. (2021)'s study too. Accordingly, this study only covers a micro-case in Beşiktaş. A micro-assessment is made regarding the local usage capacity of this kind of intervention for citizen feedback in the selected area. Therefore, the relationship between context, tool, and behavior should not be considered apart from the dynamics of the space. In further studies, selecting more safe zones and performing both observation and data controls through networked devices will support reveal this kind of application's real potential. Relatedly, testing devices of different sizes, tools and interaction types for polling in different areas will support the determination of better performances.

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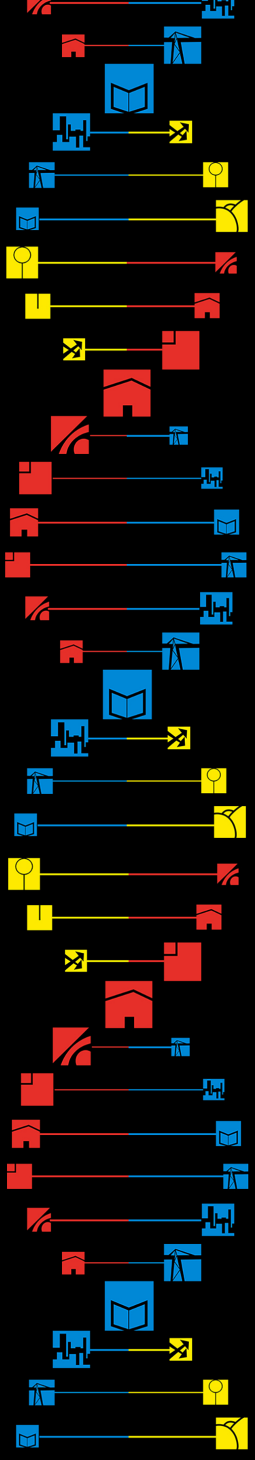

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