Smart and Fermented Cities: An Approach to Placemaking in Urban Informatics

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ABSTRACT

What makes a city meaningful to its residents? What attracts people to live in a city and to care for it? Today, we might see such questions as concerns for HCI, given the emerging agendas of smart and connected cities, IoT, and ubiquitous computing: city residents' perceptions of and attitudes towards smart city technologies will play a role in technology acceptance. Theories of "placemaking" from humanist geography and urban planning address themselves to such concerns, and they have been taken up in HCI and urban informatics research. This theory offers ideas for developing community attachment, heightening the legibility of the city, and intensifying lived experiences in the city. We add to this body of research with an analysis of several initiatives of City Yeast, a community-based design collective in Taiwan that proposes the metaphor of fermentation as an approach to placemaking. We unpack how this approach shapes their design practice and link its implications to urban informatics research in HCI. We suggest that smart cities can also be pursued by leveraging the knowledge of city residents and helping to facilitate their participation in acts of perceiving, envisioning, and improving their local communities, including but not limited to smart and connected technologies.

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CCS CONCEPTS

• **Human-centered computing → Empirical studies in collaborative and social computing**;

KEYWORDS

Smart cities, Urban informatics, Placemaking

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1 INTRODUCTION

Cities have become massive sociotechnical systems with increasing sociocultural impact, intersections of the past and the future that dynamically open up and close down ways of living, working, experiencing, and belonging. The rocketing urban population (68% of the world's population will live in urban areas by 2050 [36]) and the growing significance and complexity of urban life have made urban informatics and smart city important research agendas in HCI and CSCW as well as a key area of focus for funding agencies worldwide [16]. Researchers have envisioned and/or studied smart, sustainable, and connected urban environments that feature a network of mobile devices, sensors, actuators, and smart algorithms that collects and analyzes real time urban data. Yet some express the concern that an overly technological approach may fail by neglecting issues of the city's past and present [25]). Such a focus also reduces a city to a functional assembly of interchangeable technological parts – it is like a hotel where everyone's needs are met but there is no soul [19].

Designing for the smart city goes beyond implementing urban computing technologies and developing sophisticated data analytics. It views cities as not merely physical spaces

or geographical containers for social and technical phenomena but as meaningful intersections of people, places, histories, purposes, and technologies; in these intersections, new culture is produced [13, 14, 18, 41, 45, 48]. It is about placemaking – a serious attempt at understanding of a city's identity, as it is experienced by its residents and visitors. City residents' perceptions of and attitudes towards smart city technologies as well as how they understand and value a city play a role in technology acceptance and are closely implicated in the success of smart city initiatives.

Responding to the call for more holistic approaches to smart and connected cities, including the call for a greater emphasis on placemaking in urban informatics and HCI research, we focus on how smart and connected cities agendas might be joined to an urban identity project as a part of its envisioning and implementation. Specifically, we present an empirical study of an urban design collective's practices in Taipei, Taiwan. The collective is called City Yeast, and community activists and designers established it in 2006 to invite and engage residents of Taipei to co-design neighborhoods in Taipei and redefine Taipei's identity. Informed by theories of place and placemaking from humanist geography and urban planning, we focus on how City Yeast's practices reveal city inhabitants' understandings, expectations, and aspirations for a desirable future of their city. We were particularly intrigued by their use of the metaphor of fermentation, which views city residents as yeasts, who through the gradual process of fermentation reveal and revitalize the unique characteristics of their neighborhoods.

We contribute to urban informatics research in HCI by presenting a rich, situated, and novel account exploring the inter-sections of technology and placemaking as they are intertwined in a particular city. We observe that many approaches to smart cities rely on top-down innovation and focus on big data-supported decision-making; in contrast, we suggest that smart cities can also be pursued by leveraging the knowledge of city residents and helping to facilitate their participation in acts of perceiving, envisioning, and improving their local communities, including but not limited to smart and connected technologies. Using City Yeast as a case, we provide empirical evidence regarding the conflicts and tensions among people, place, and technology within the dilemma of urban decay and urban revitalization. We unpack how the theory of placemaking offers ideas of developing community attachment, heightening the legibility of the city, and intensifying lived experiences in the city. We highlight the fermentation metaphor as a viable placemaking strategy for urban revitalization, which emphasizes long-term cultivation of distinctive neighborhood culture as a foundation for designing complex sociotechnical assemblages in urban environment. Finally, inspired by the fermentation approach, we also propose a series of design implications for smart and connected city technologies.

2 BACKGROUND

In order to develop the connection between city residents' experiences and the technological agenda of the smart urban environment, and to identify actionable tactics to design meaningful smart and connected communities, we situate our work in relation to two strands of research – urban informatics and smart cities as well as place and placemaking in urban design and HCI.

Urban Informatics and Smart Cities

Urban informatics and smart cities are two primary research agendas in HCI and CSCW to explore possible urban futures of the intertwining relationship among technology, physical space, distinctive local culture, and city residents.

Specifically, Freeman et al. summarized three emphases in urban informatics literature [18]: 1) distinction between the technical construct of a city and the cultural and social aspects of city life [4, 10, 13, 14]; 2) a need to reconceptualize the notion of "the city"[10, 13, 28, 49]; and 3) an emphasis on how to make the urban design process more broadly open and participatory [17, 43, 49].

In addition, current research on smart city tends to have a more technological focus, with attention to the cyberinfrastructure and management of large scale, complex, and real life urban data flow. Though definitions of smart city vary, the "smartness" of a city is often regarded as: 1) the embedment of mobile and pervasive computing, ultra-high speed wireless networks, and urban IoTs into the physical spaces of the city as well as everyday objects and activities within the cities [1, 41, 52]; 2) the use of these embedded urban technologies to develop new forms of urban governance and organization, solve critical urban problems, and make public information and services more open and accessible [1, 3]. The former focuses on developing advanced and innovative technologies for urban environments and the latter emphasizes how large amount of data can be produced, monitored, collected, manipulated, and used in cities.

Both strands of work highlight the role of cities in redefining technology and human life – they are integrated social, physical, institutional, and digital spaces where ubiquitous computing technologies improve socioeconomic activities and physical infrastructure of the city, and enhance the problem-solving capabilities of urban communities [41, 48]. Yet in many cases, the heterogeneity within the city, and its contribution to that city's cultural life, is overlooked. For example, a study released by Cisco at its Internet of Things World Forum 2017 (IoTWF) found that 60% of IoT initiatives for smart cities failed [44]. It cites culture, organization, and leadership,in addition to technology, as critical to successful

smart city project. Another example is Indian Prime Minister Narendra Modi's unsuccessful plan to build 100 smart cities by 2020. According to Housing and Land Rights Network's report, the project is failing due to its focus on technology of the future but neglect of issues of India's past and present, including its agrarian crisis, lack of civil rights for women, forced evictions to make room for the implementation of smart city projects, and so forth [25].

Place and Placemaking in HCI

A related strand of research in HCI concerns notions of space and place. Many researchers focused on the physical nature of space and the meaningful construct of place (e.g.,[12, 21, 32]): space is a natural fact, and place is a cultural product. In this sense, space is static and refers to geographic extension independent of human consciousness. What distinguishes place from space is inhabitants' sense-making activities: human responses to their living environment, including understandings of behavioral appropriateness and cultural expectations, make place a cultural and social phenomenon [21, 33]. Humanist geographer Yi-Fu Tuan further emphasized the importance of the experiential dimension in making places. For Tuan, a place is a time-based phenomenon created by human experience: It is the conjunction of the past, the present and the future [47]. Dourish re-visited the intertwining relationship between space (or = spatiality) and place to redefine how people re-encounter everyday space due to the spread of wireless, mobile, and collaborative technologies [9]. For him, the notion of place as explored prior remains relatively intact but there is a need to reconsider how we generate spatial forms and articulate spatial experiences. Taken together, these studies illustrate that a place is made when it is valued, cherished, and experienced by its inhabitants.

However, it remains challenging to make socially and culturally meaningful places especially for city residents. A common understanding of placemaking is "the set of social, political and material processes by which people iteratively create and recreate the experienced geographies in which they live" [40]. Place-making is challenging in cities due to the struggle to identify the cultural meanings of the cities and whom cities are for [27]. Globalization and the pursuit of "smartness" in urban design bring about additional complexity in that much attention is devoted to the "mega," well-established, urban spaces sometimes at the expense of smaller, loosely connected neighborhoods [19]. Dourish and Bell called for the need to reconsider spaces as infrastructures to redefine the new relationship between people and their city in the era of pervasive computing: it involves both the practical organization of space (i.e., how environmental structure affords ongoing achievement of joint actions) and the cultural organization of space (i.e., how environmental structure affords collective production and performance of cultural meaning) [11].

In sum, three strategies of meaningful placemaking for city residents have been identified in HCI and urban design:

1) **Community attachment** featuring an emotional connection to a place that affords satisfaction, loyalty, and passion [15]. Knight Foundation's report considers community attachment "soul" of the cities: residents who are emotionally attached to their city are proud of its past and present and are confident in its future. For them, buildings can be renewed and infrastructure can be upgraded but their bond to their city is irreplaceable.

2) The apparent distinction or "**legibility**" of the cityscape [30, 31]. Lynch described legibility as ways in which components of a city can be recognized and can be organized into a coherent pattern. Therefore, legibility does not refer to the city itself but to how it is perceived or read by its inhabitants. In this process, historic traces are preserved, modified, and revised and artifacts that embody cultural traditions are reconsidered to be landscape resources [31].

3)The depth and intensity of **lived human experience**. Placemaking is to make a place that can be experienced and cherished by its inhabitants. Yet how its inhabitants experience a place is through the simple fact of being lived in – "by being lived in, the actual physical and social spaces of an urban neighborhood come to be modified and possibly even transformed" [19]. As such, inhabitants' experiences with a place happen naturally in their everyday activities and social interaction that are formed overtime.

Placemaking, thus, could be a viable strategy for HCI researchers interested in designing meaningful future cities and urban life – i.e., to make residents value, cherish, and experience where they live. For example, in the project "Aarhus by Night," Dalsgaard and Halskov created an interactive media façade to engage local citizens in new kinds of public behavior [7]. Peacock designed an ongoing urban design project (i.e., Streets for People) to engage children in political processes [38]. Tomitsch explored the role of large digital screens in recreating public space and reshaping the social and cultural practices inherent to users of the place [[46]. We thus see an opportunity to unite the research agenda of placemaking and smart and connected communities here to create a better quality of life in urban spaces.

3 RESEARCH SITE AND METHODOLOGY

Research site. "City Yeast" is a long-term project of AGUA De-sign. Founded by a female designer, Yuru Zhou, in 1994 in Paris. Zhou moved the entire practice to Taiwan in 1996 and gradually grew the design firm to include Taiwanese urban designers who received training in urban planning, environmental design, and architecture and have extensive professional practice in Taiwan, Europe, and North America.

AGUA Design launched "City Yeast" in 2006, in hope that "everyone can be inspired about their environment and grew to love it" [51]. Inspired by the vibrant urban culture that cities such as Paris and Barcelona exhibit, AGUA encouraged city inhabitants, designers, and policy-makers through "City Yeast" to consider ways to "make people fall in love with this city, and to make them emotionally attached to it" (emphasis added) [51]. AGUA motivated City Yeast as a project in the following way:

"*We develop "City Yeast" project in hope to spread more attractive elements in the city. Through spreading these elements and let them "ferment" as yeasts do, we are making the city more attractive or adherent to visitors and residents. [...] We join the force to apply creativities to make this place and its culture unique; the participating designers, interior designers, industrial designers, movie makers, poets, and writers are all like yeasts, cultivating and spreading the ideas. You are also yeasts!*"

As the quote suggests, the project name "City Yeast" is significant in that it connotes a notion of intentional fermentation (e.g., that of winemaking): notions of cultivation or brewing – slowly over time, which is distinctive from the temporality of technological innovation that often places emphasis on speed and agility. It also contrasts most of the design projects that have a more discrete and finite time frame. Also, by calling out all city inhabitants as "yeasts," City Yeast purposefully rallies city residents behind this long-term cause, to co-design the city's future in a collective manner [13, 14, 34].

It is also important to note City Yeast's tangible accomplishments: Since 2006, City Yeast has developed more than 2300 initiatives large and small around four topics – "how to make city better," "how to make yourself better," "how to make city dance," and "how to make city goods;" collaborated with more than 1000 designers and 36 enterprises; held over 33 exhibitions both domestically and abroad; proposed, planned, and implemented 18 large scale urban experimental urban design projects, and held over 200 participatory workshops with tens of thousands Taiwanese citizens.

Methodology. We collected data in three ways. The primary data source was threads (e.g., posts and comments) about City Yeast members' collective urban design projects, community activities, workshops, and public exhibitions posted on the City Yeast Facebook group. We focus on this data source due to two reasons: 1) in addition to the official website of City Yeast, this Facebook group page, which has 21,890 followers, has become a major social media platform for designers, technologies, citizens, and even policy makers who are interested in redesigning cities in Taiwan to seek and share information, connect with others, or further engage in collective efforts. Content posted and shared in this group, therefore, provides a comprehensive documentation of how collective urban design projects were conducted and various stakeholders' reactions to them; 2) founders and organizers of City Yeast often openly share their motivations to engage everyday citizens in design activities in urban environments, progresses and efforts to make it happen, and lessons learned. These self-disclosure and reflections communicate and make visible the motivations and processes for some of the most successful and influential participatory urban design initiatives in the country. We collected all posts and comments on the City Yeast Facebook group from April 10, 2010 to February 1, 2018. As a result, 2,308 posts plus their associated comments were collected.

To understand public perception of City Yeast's efforts for collective urban design, we also collected media coverage about City Yeast in both English and Chinese languages. We retrieved relevant articles by conducting a Google Search using keywords such as "City Yeast Taipei" and its Chinese version "都市酵母" to sensitize ourselves for public reception around urban design and planning initiatives and events sponsored by City Yeast. After removing redundant articles and webpages (e.g., City Yeast's official website), our dataset includes 102 online articles, including newspaper and magazine articles, online forum posts, blogs, and TV news. We also conducted archival analysis of historical accounts of urban development in Taipei, including policy papers. Two of the authors traveled to Taipei City and conducted observations of projects designed, implemented, and/or sponsored by City Yeast (e.g., Dadaocheng Story House). In this study, these observations were used to contextualize our under-standing of City Yeast's efforts.

We then used an empirical, in-depth qualitative analysis of the collected Facebook and online media data. Our coding and analytical procedures were: 1) All authors closely read through the collected data and collectively identified thematic topics and common features in the data for further analysis. The criteria included: filtering out posts and media coverage of advertisements, general announcements, and product introduction; and identifying posts and online articles that demonstrated City Yeast's collective endeavor on their domains of inquiry (e.g., urban design, cultural creativity, citizen participation, and environmental aesthetics). 2) All authors carefully examined and reviewed the thematic topics and developed sub-themes. 3) All authors collaborated in an iterative coding process to discuss, combine, and refine themes and features to generate a rich description synthesizing how City Yeast and Taipei residents engage collectively in placemaking activities in the city.

4 FINDINGS

In this section we present City Yeast's various placemaking endeavors: they draw out what city residents considered culturally and experientially meaningful living in Taipei and/or cultivate values and meanings with/for them over time.

City Yeast believed that developing a city's image was a gradual process, which required long-term investment from both the designers and the residents. Everyone may only make a small contribution to redesigning and recreating an element of an urban space. Yet collectively they would transform a physical space with no meaning into a place that was imbued with collective memories, social experiences, and cultural implications. This was the yeast/fermentation metaphor that guided City Yeast's collective design practices: city residents were yeasts and their understandings, perceptions, and interpretations of their surroundings by "being lived in" was a gradual process of fermentation. Overtime, these yeasts' activities, experiences, and interactions would establish the city's unique identity and build a vision of a desirable future for their city.

An online news article reported AGUA Founder Yuru Zhou's comments on the objective of a long-term urban design project "City Yeast" in an interview: "*We are jealous of Kyoto's delicacy and Berlin's vitality; we like Barcelona's old and new and Rome's history; we pursue New York City's diversity and Melbourne's livability. We seem to easily fall in love with others' cities but tend to ignore our own. What is the image of Taiwan, or Taipei, to the world? Even some people who live in Taiwan cannot answer this question, not to mention foreigners. I want to advocate changes in every corner of our city – to promote people's emotional attachment to this island, to solve ongoing social problems, and to make people be proud of their own life from one's heart.*"

In this quote, Zhou explained that the goal of City Yeast was to make Taipei a place where its residents felt attached and proud while also enjoying good quality of life. For her, a city becomes meaningful not only because it accommodates and fulfills its inhabitants' basic needs, it reveals "t*he way in which the self is inwardly affected. [...] In 'feeling' an intention and an affection coincide in the same experience*" [59]. She recalled her concern about Taipei being "*noisy, messy, and identityless*" when she returned to Taiwan after many years of studying in Europe. Taipei had been no different from any other large cities in the world – a collection of skyscrapers, shopping malls, and office buildings. As a professionally trained designer and as a citizen, she wrote in a blog explaining how design can be a catalyst for change for Taipei and Taiwan: "*Many people think about what the value of their life is. I think about what the value of design is. Our design should aim at least 50 years from now one: is your design still valuable and meaningful after 50 years? Does design only serve business and individual customers? Is design only for encouraging consumption and business success? What can design do for our people, cities, and nation?*"

These reflections led to the establishment of City Yeast as a long-term design project for the city of Taipei. The significance is that City Yeast frames meaningful urban living as a design problem rather than a technological problem – a future city that is desirable for its residents should have an identity; and building such a city would need community-driven design efforts on a scale of at least 50 years. Yet the global trend of Westernization of cities is seen as a threat to such efforts. Therefore, the mission of City Yeast is to think about ways to reclaim the city's identity participatively with the residents over time, through the following means.

Cultivating Place Attachment

The process by which we form affective connection to physical spaces is known as placement attachment [22, 29]. As Gifford observed, "Place attachment emphasizes the manner in which we personally construct our notions of place"[20]. A key aspect of place attachment is the social interaction in these spaces: "place attachment is the emotional link formed by an individual to a physical site that has been given meaning through interaction" [35]. The emotional bonds we form with physical spaces are developed over time and through interpersonal relationships, and "when humans invest meaning in a portion of space and then become *attached* to it in some way it becomes a place" ([6], emphasis added). In this section, we unpack City Yeast's strategies to cultivate residents' attachment to Taipei as a place.

Taipei City Color: Cultivating Place Attachment through Place Identity. People's perception of the city is always affected by the hues chosen by individuals and groups intentionally or unintentionally, and as such, it constitutes "the first sight of the city." In an effort to render the city visible to its residents [30, 47], City Yeast launched a project called "Taipei City Color (台北都市色彩)" in 2012 (and continue till this day) to call attention to the visual quality of Taipei as way to define the city. The project was implemented through a collaboration among residents, NGOs, and city government and used methods such as walking probes (known in the city as "Taipei Color Walk"), field trips, and status surveys among others to systematically collect and document urban layouts and colors of Taipei (and to a lesser extent, Taiwan), including landmark colors, store colors, tree colors, urban bridge colors, city street furniture colors, food colors among others for public understanding, action, and prospection about the city. The initial color identification and collection activities then served as the foundation for a series of strategically integrated, multifaceted co-design workshops ("Spreading the Seeds of Color") with Taipei residents of all age groups

to involve them with major urban landscape planning initiatives in the city. For example, in "Very Little Color Designers" and "City Color Experience and Appreciation" workshops, children aged 2 to 12 received basic aesthetic theory and appreciation lessons and created artwork for the city using the identified Taipei City color schemes.

Other workshops included targeted tasks such as improving Taipei's public services by color, redesigning colors of bus stops to better reflect the historical context of a given street. In two blog posts, Taipei residents observed how a sense of belonging for them was created through the involvement of the Taipei City Color initiative:

"*She [Taipei] is a warzone for people who want to succeed. She is also the hometown for many of us. She is efficiency, creativity, and hospitality. She is also repetitiveness, stubbornness, and cruelty. She is as jazzy as yellow, as seclusive as grey, as arrogant as purple, as passionate as red, and as cold as black. She fosters us, and we become her.*"

"*Taipei has cutting edge technologies to keep upgrading its infrastructure and public service: we have convenient public transportation, impressive skyline, and high-speed wireless connections. But no matter where I go, I will always remember Taipei's color: I love its streets with all the trees – during the day they show the refreshing green; at dusk they serve the warm yellow from the street lights. You can smell flowers everywhere and enjoy a relaxing walk. I love such a Taipei and I hope our offspring would experience the same.*"

These quotes show that residents in Taipei established strong emotional connections to this city in part through the city's aesthetic qualities. The first quote includes the use of several emotional adjectives to explicate the city's characteristics (e.g., jazzy, arrogant, and passionate). Interestingly, this resident related those characteristics to various colors. For him, Taipei's colors represented how he experienced the city; they also represented the bond he had with the city – "*she fosters us, and we become her.*" The second quote showed the poster's pride in Taipei as a smarter, more connected, diverse, and modern city. At the same time, it was aesthetic qualities such as color, sound, and lighting, beyond infrastructure and IT that forged Taipei's identity to this individual. ("*no matter when I go, I will always remember Taipei's color*"). Both cases illustrate place identity as a key component of one's affective attachment to a city, solidified through memories, interpretations, and feelings that individual has about the space.

Tour of the 100-Year Dadaocheng: Cultivating Place Attachment through Cultural Heritage. In conceptualizing the relationship between time and place, Tuan observed that "In time we become familiar with a place, which means that we can take more and more of it for granted. In time, a new house ceases to make little demands on our attention; it is as comfortable and unobstrusive as an old pair of slippers" [47]. To reawake the memories of parts of Taipei in its residents and to further strength the bond between them and the city, City Yeast launched one of its signature projects in 2011 called "The Tour of 100-year Old Dadaocheng" (大稻埕百年巡禮).

Dadaocheng is an area in Datong District, Taipei. Known for the local Taiwanese cuisine, Dadaocheng was an important trading port in the 19th century and remains a major tourist attraction in Taipei for its well-preserved historical baroque architecture from the Dutch occupation era (1624-1661) and the Chinese New Year's Market. After World War II, Taiwan's textile industry rose, and Dadaocheng became the home to many successful textile and food manufacturers in Taiwan. In addition to its historical significance, Dadaocheng remains a popular destination for holiday shopping. Each year, in the two weeks leading to Chinese Lunar New Year, more than 750,000 people flock to Dihua Street, one of the oldest streets in Taipei, to purchase necessities for the holidays, from dried goods, incense for worshipping, teas, festive decorations to traditional Chinese herbal medicine.

Daodaocheng's history is in many ways a miniature of the history of Taipei. It also details the industrial, cultural, social, and political development of Taiwan. However, to the younger generation Dadaocheng is nothing but an outdated space for shopping, as observed by a resident in his 20s: "*Dihua Street is a place to visit just once a year – Chinese New Year.*" Another commented, "*it had little appealing to many Taipei residents outside the festive season.*" To address this, City Yeast worked with city planners and a group of volunteers that consisted of longtime Dadaocheng residents, shop owners, urban designers, and city government officials in three interrelated activities: "Wiki Dadoacheng Taipei," "Daodaocheng Monologues," and "Dadoacheng Walking Tour."

In "Wiki Dadaocheng Taipei," Taipei residents collaborated with shops and small businesses in the Dadaocheng area to create QR code for each shop and their best goods (e.g., rare Chinese herbal medicine and dried foods). Once scanned, one can read the history of the shop and a brief introduction of its business. Additionally, photos of 100 best goods sold in Dadaocheng were uploaded to Wikipedia in hopes of introducing Taipei's unique history to the whole world. In "Dadaocheng Walking Tour," 30 international designers who attended the 2011 International Design Association Congress in Taipei took a multi-day discovery walking tour of Dadaocheng to experience Taiwanese cuisine and everyday life. The result is a video they created to document their impressions of Dadaocheng (and Taiwanese) culture. The unique characteristics of Dadaocheng was thus rendered visible through taste, smell, sound, and skin sensation, because "a place achieves concrete reality when our experience of it is total, that is, through all the senses as well as with the

active and reflective mind" [46]. Elsewhere in "Daodaocheng Monologues," Taiwanese artists and writers were invited to document the past and the present of Dadaocheng through images and short stories, presenting aspects of everyday life throughout the history of Dadaocheng. The collection of their work was then published as an eBook for distribution to all the Taipei residents.

A City Yeast member described the purpose of these activities: "*preserving history is the way to help the younger generation build the sense of identity. Only when they know the history of the place they belong to can they emotionally attach to this city as well as love and protect it.*" While long residence makes it possible for us to know our city intimately, it might gradually lose sharpness for us. The series of "Tour of 100-Year old Dadaocheng" activities provide opportunities for Taipei residents to construct sensual "Dadaocheng experiences"– these experiences allow residents to glimpse directly into its nostalgic past through objects, images, smell, shape, sounds, and other attributes of the space, and in so doing, activating the emotional bond to the city.

In both cases, emergent qualities of the city have led certain districts to become ugly, even seedy. The design challenge for City Yeast and for residents more broadly is to recover these districts' distinctive beauty by search for their distinctive identity, itself a design inquiry. The takeaways for urban informatics researchers interested in developing technologies for smart and connected communities could be to leverage design methods (e.g., color palette and walking tours) and sensuality (e.g., city colors and sensual experiences of taste, smell, and sound) among others to create residents' emotional link to the city.

Heighten Legibility of the City as A *Place*

Place can be defined in a variety of ways. One strategy for placemaking in the city is to render it visible to the residents. As Lynch observes, "Although clarity or legibility is by no means the only important property of a beautiful city, it is of special importance when considering environments at the urban scale of size, time, and complexity. To understand this, we must consider not just the city as a thing in itself, but the city being perceived by its inhabitants"[30]. The visual prominence of the city draws attention to the residents, making it possible for residents to perceive the city in a visceral way with ease.

Many City Yeast participants expressed their concern about visibility of Taipei – when the city became more westernized and generalized, it grew to be less alive and recognizable to its residents. One observed in a Facebook post:

"*We used to have a strong local culture in Taiwan because of our history. Now we are mostly guided by strong Western cultures. Our own culture is getting weaker and weaker. When we are chasing those mainstream Western cultures, we are losing our self-identity and self-awareness. One example is those modern Western buildings – they are everywhere in Taiwan but they do not fit our culture. Now almost everyone in Taiwan has a smart phone. We can easily connect to the whole world but we still don't know who we are. Only when we restore our self-identity and truly understand our distinctive culture can we build a beautiful city, which will exhibit our cultural attraction.*"

For the residents, there is an urgent need to restore the unique image of Taipei and Taiwan so that the residents can appreciate its distinctiveness. Accordingly, City Yeast began another long-term project called "Meet Taipei: Design" in 2013 that leverages design thinking to heighten the visibility of neighbor-hood and alley ways in Taipei to its residents, and in the process, enhance social interaction. Since then, they have organized more than 100 urban co-design activities with residents to heighten the visibility of alleyways and neighborhoods and create potential connections among different districts of Taipei. This includes the planning and holding used garment exchange markets, transforming old and abandoned amusement rides into temporary public furniture in the neighborhood, organizing co-design sessions with residents to create decorated lights for the neighborhood, and storytelling and reminiscing about particular the lived environments among others. Residents express appreciation of "Meet Taipei: Design", and in one case lobbied to make the temporary rides-turned-furniture permanent because "I *love the fact we creatively recycled unwanted materials into functional objects for our neighborhood,*" and "*These furniture makes my neighbor-hood come alive, and I get to meet and interact with my neighbors.*" The city is illuminated through design and interpersonal interactions and the particular neighborhood culture becomes less general and carries a more distinctive flare.

In another activity, City Yeast worked with residents to redesign signboards in Taipei, which aimed at recreating Taipei's streetscape by using small and creative signboards. One online news article summarized this activity:

"*Signboards convey meanings, directions, and information about a city by combining text and visuals. However, Taiwan's signboards are often limited in sparkling light boxes or neon light boxes. Designs of these signboards also tend to focus on size and eye-catching rather than a harmony with the context and surroundings. Technologies of LED lights and smart lights add to the complexity but do not necessarily make them more informative, attractive, or appropriate. City Yeast's project of discovering and designing signboards for Taipei is taking a different approach: rather than making large high-tech signboards, designers and residents attempt to reveal a city's unique characteristics by designing small and creative signboards. In doing so, they hope to make people be more aware of their*

living spaces and pay attention to beautiful views that they often ignore."

A Taipei resident also posted on Facebook:

"*More and more information increasingly occupy our world. Every shop wants to be 'seen' by us so everyone is making bigger and bigger signboards to force us to 'see' – this is what our streets look like now. But do we really need this amount of information? Are these presented information visually pleasant or just part of a nightmare? We really need to reconsider how we design our streetscape.*"

Both quotes warned that the existing signboards on Taipei's streets either undermined the attractiveness of Taipei or made it challenging for residents to perceive and appreciate the living environment. One of the reasons for the high density of commercial signs lined up over the roads in Taiwan is due to the country's high percentage of small and family businesses, often clustering in neighborhoods that sell same products (e.g., shoe street). Every shop creates ever-larger signboards to compete for customers' attention, leading to a collective effect of rendering the city unrecognizable. As one resident commented, "*Was this mess of signboards defining Taiwan? What of Taipei or Taiwan could be seen and appreciated out of such a mess?*"

The residents appreciate the opportunity to address this issue, as seen in this individual's reflection on participating in the signboard redesign:

"*I always feel most signboards in Taipei do not match the personalities of Taiwan people. While Taiwan is influenced by Western culture, grown up with more than 5000 years of Chinese culture, most of us are low key, self-disciplined, and not so expressive. Those signboards we designed reflect better who we are as citizens of Taiwan: unique but not flamboyant. They are smaller compared to the old signs – only 50 by 50 centimeter. You can only see them when you enter the block and walk up to the shops. In a way, they do more than just promoting the shops but for us to rediscover our life and culture.*"

These quotes illustrate that these community-designed sign-boards make aspects of Taipei recognizable to its residents, with their situated locales, sizes, colors, and purposes. The physicality and the varying attributes of signboards help make up a concrete mental image of Taipei for the residents, contributing to the apparent "clarity or 'legibility' of the cityscape" [30]. In other words, when the city feels thoroughly familiar to us, it has become a place. Such legibility also allows for the development of spatial skills and competence in that signboards help structure the city and the residents learn to navigate the city through them over time.

Yet the plan to render a city more recognizable is not without challenges. There are misalignments between what the designers intended and residents' perception. A case in point is "Shilin Light Festival"(士林那道光), a two-week urban image enhancement initiative in Shilin district in 2015 City Yeast designed and managed. Shilin is a district of Taipei and home to a large foreign population. It has long been a top choice for expatriates from US, Europe, and Japan to live and run businesses. One of the 3 components in Shilin Light Festival is a public interactive art installation called "Shilin Balloon Walk" where 1000 6-feet tall light pillars made with cylinder balloons were placed under a major metro bridge in Shilin, spanning more than 220 meters long of the bridge. Residents were encouraged to walk through and interact with the balloon pillars, and the movement would activate stories and soundscape about Shilin from the bygone era. At night, the balloons illuminated with colorful lights, creating a sensual effect that also enhanced residents' spatial awareness.

City Yeast designers endeavored to make a place for the residents because "place is whatever stable object catches our attention" [47]. By placing a large amount of colorful light pillars in a public and crowded area (e.g., a metro bridge), with effects of sound and motion, the project on the surface succeeded at creating a spectacle of anemone-like scene that attracted the attention of the residents. At the same time, it exposed issues about the use, ownership, and maintenance of public interactive art installation. After the first day of exhibition, about half of the pillars on display went missing or damaged; after the first week of exhibition, only a third of the pillars remained onsite; and on the 12th day of the event, all of the 1000 balloon pillars were either stolen or damaged by residents. City Yeast members described their frustration in a Facebook post:

"*Prior to the installation, we brainstormed and came to a consensus of how best to foster sustained interest and engagement with 'Shilin Balloon Walk': It would be open to residents of all ages 24/7; we would not dictate how the installation was experienced and/or used; and there would be no display of warning signs of other rules. We had hoped the residents would see the value and experienced it with ease. However, we learned that by not setting up any rules of engagement, the public was careless with the balloon pillars. More than 600 pillars were damaged in just one week. We worked hard to clean and repair the damaged pillars every day, but we just could not catch up to the rate that these pillars were damaged.*"

At the end, City Yeast was forced to put up signs that read "Please cherish the public art installation" and "Making our environment better is not the organizers' or the designers' job; it's everyone's job." The "Shilin Balloon Walk," while damaged, became an occasion for residents and critics alike to reflect:

"*It was surprising that how an interactive art exhibition turned to a topic for discussion on public awareness and citizen quality. Design thinking is improving our living environment. But I think what is more important is that we need to improve our awareness about the public and the environment.*

'Taking care of public property' should not just be a slogan in elementary school textbooks but an everyday practice for every citizen." (An online news article written by an urban design critic)

"*People are talking about how the Taiwan society is not advanced enough for an exhibition such as 'Shilin Light Festival.' But if we don't start, how can we have these experiences? How can we improve ourselves and pursue other possibilities? I really appreciate what City Yeast did. We should all put in the effort and help improve the society. I look forward to more discussions on this project and its legacy for Taiwan.*" (A resident's blog post)

In "Shilin Balloon Walk," a neighborhood symbol was carefully designed but ultimately rejected by the neighborhood. Residents did not seem to appreciate the artwork or take ownership of it. The case reveals misalignments between designers' intention for an urban design project and the public perception and use of such a project that undercut the efforts intended to fortify urban social interaction and a sense of place. Taken together, both projects (signboards and Shilin lights) focused on the relationship between signifiers of neighborhoods and neighborhoods themselves. They pointed to the risk that signifiers could become the central objects and diminish values of the signified – the actual neighborhoods. In this sense, heighten the legibility of the city requires direct interventions into the neighborhoods themselves rather than their signifiers – whether intentionally created or merely emergent. We discuss such direct interventions in the next section.

Intensifying Lived Experiences for *Place*

Researchers in HCI and design have proposed holistic accounts of user experience. For example, McCarthy and Wright prioritize felt experience to emphasize the "personal and particular character" of living with technology [50]. Philosophical approaches to experience in HCI, drawing from Deweyan pragmatism [39, 50] and Richard Shusterman's somaesthetics [23, 24, 26, 42] foreground "experiential qualities, such as involvement, delight, coming alive, pleasure, and embodiment [...] all of the objective and subjective qualities come together coherently as a whole" [2]. In the city, space and architecture are experienced in an embodied way through movement, touch, perception (both visual and haptic), sound, and one's interpretation and meaning-making of the experience. In a report regarding the development of smart cities in Taiwan [5], smart living experience was considered a core component of smart city, yet little was known how best to create such an experience. Many residents shared this concern:

"*It is said that Taipei is like a teenage boy – he keeps growing and he hasn't established his identity. But he will settle down eventually. What will an adult Taipei look like? Many architects, designers, artists, poets, and politicians are pondering about this question. They all have different imaginations. I appreciate all of them but I believe that the people who live here will determine the identity of Taipei. No one knows a city better than its inhabitants. They should be central actors, not outsiders or observers, in designing a city's future.*" (A Facebook post)

"*We all hope that Taipei and Taiwan have their distinctive features. If you are unhappy about the status quo of Taipei, do not just complain. You are not a user of Taipei. You live in it. You experience it. Only when city inhabitants truly engage in co-designing and co-constructing of the city can the city come alive and provide inspiration for its residents. This is why I like City Yeast – we work together to make Taipei more beautiful and desirable. Such a Taipei is not Yuru Zhou's or designers'; it is ours.*" (A resident's blog post)

These two quotes show that citizens' active and situated engagement is closely connected to the quality of urban lived experience and the formation of a coherent identity of the city. Several projects initiated by City Yeast aim at creating conditions conducive to generating memorable urban experiences. In "Taipei Neighborly Streets," City Yeast set up writable surfaces throughout different neighborhoods in Taipei for residents to write in their answers to three questions, "*I like this street because …*" "*I know this street has the following types of plants and little critters*," and "*I hope the city can have the following in the future.*" The answers were then collected and documented and used as jumping off points for resident co-design workshops where the designers and residents engaged in urban redesign together. A participant commented on Facebook about how these activities revealed what his street meant for him: "*This street is where we have our daily life. Knowing your street means knowing yourself. This approach could become a model for rebuilding all the streets, neighborhoods, and cities in Taiawan.*" Urban design in this case became tightly woven into the fabric of everyday experience.

Similarly, in the project "Markets as Elementary Schools," City Yeast and residents focused on building connections between Taiwan's younger generation and traditional markets. Traditional markets are simultaneously spaces where goods are sold and places where specifics of mundane life, tastes of living, and local culture unfold. Taipei residents commented on the significance of traditional markets for urban experiences:

"*Cities originated from markets. Markets represent people's real life – they are crowded, noisy, and messy. Markets make you feel you are alive. Markets are the most unique places in a city. If you want to see authentic everyday life, you go to the markets. You can never experience the same in any other part of the city or through any type of technology. Unfortunately traditional markets are dying all over Taiwan. More and more*

young people are obsessed with their modern life style and are unaware that they have missed some of the best opportunities to know their city and the people living in it." (A resident's blog post)

"*Traditional markets in Taiwan are places where you can experience the real Taiwan. They are the places where you can find the hidden lived experiences and cultural specifics from eating to buying and selling and where long-term relationship can be forged between shop owners and customers. Traditional markets are manifestations of our cultural heritage.*" (A Facebook post)

The "Markets as Elementary Schools" project aimed to combine markets with education where kids learn how these markets function, nutrition, and the relationship between food and body, and revitalize these markets through shop renovation, sponsored by IKEA Taiwan. The design principle was to, as op-posed to replace the traditional market scenes, take into account product arrangement and customer flow. A Taipei resident, who was a merchant in one of the markets, was so touched after participating in this project: "*I made millions of dollars today because I helped the future of our nation understand our culture and life.*" Another commented, "*When I see those children asked a butcher and a fisherman some funny but basic questions, I feel like two paralleling universes are connected. This is exactly how a city changes and evolves.*"

We see clear take-homes for urban informatics research: traditional streets and markets reveal unique identities in ways that their global-generic counterparts (e.g., modern apartment buildings and grocery stores) lack. How residents experience everyday places such as streets and markets in their mundane life define these places and allow them to apprehend their existence of these places cross different generations: they live socially, act based on "a shared understanding of appropriate behavior" [8], and rely on specific places to preserve the shared understanding. Direct interventions in actual neighborhood make them more vibrant and alive and offer various stakeholders new opportunities to live and revive their urban environment.

5 CONCLUDING DISCUSSION

We have shown that many citizens of Taipei feel that the city lacks a global identity and that any initiative to make it smart and connected should build on such an identity. In pursuing such an identity collectively, City Yeast focuses on exploring current issues in Taipei's urban design and city infrastructure and experimenting with (sometimes symbolic) strategies to redesign Taipei for its future. We have also found that citizens fear that smart city technologies – IoT, sensors, mobile networks, and so on – comprise a global-generic infrastructure. Similar to sky-scrapers and modern grocery stores, this new infrastructure threatens the vibrancy of their city even as it modernizes it.

In what follows, we develop our thoughts on how the City Yeast approach relates to placemaking by 1) focusing on how smart and connected cities agendas might be joined to an urban identity project as a part of its envisioning and implementation; 2) leveraging the knowledge of city dwellers and helping to facilitate their participation in acts of perceiving, envisioning, and improving their local communities; and 3) offering design implications for smart city technologists.

A Challenge to Modern Cities: The Destruction of Places

The destruction of places is the opposite of placemaking and one of the more heartrending stories of city building [19]. It can take many forms, including the removal of residents, slum clearance, rehousing, and redevelopment [19]. While the destruction of places is a common practice in the name of urban renewal, it comes at a higher cost than is often recognized; what is destroyed is not only the visible decay and the detritus, but also the intangible history, associations, social clusterings, and other meanings of the place.

The word "placemaking" might seem to imply that a space comes first, and then place is somehow added on top of it, like gravy on a potato. But our research helped us see that every neighborhood and street of Taipei was always already a place. Taipei neighborhoods and districts already have identity; they are already experientially meaningful places. But that is at the level of individual neighborhoods. As a city, however, Taipei's identity and distinctiveness is unclear because of the decline of some old neighborhoods, with their distinctive histories, charms, and inhabitants, and their replacement with new neighborhoods developed in the generic urban vocabulary of shopping malls and tall office buildings. Understandably, it is not easy to see older neighborhoods go to seed; indeed, residents might no longer recognize or bond with them; younger generations move away.

The dilemma as experienced by residents is that they must choose between seedy neighborhoods in decay, or gentrified new neighborhoods that lack character and that many of them will not be able to afford. As a resident of Taipei put it, people do not know who they are or what they will be in the future. City Yeast – like many similar groups all over the world – is seeking to develop a third way.

A Fermentation Approach as Placemaking for Designing Smart and Connected Cities

City Yeast has proposed a metaphor of "fermentation" as placemaking to approach urban revitalization in Taipei's specific cultural context. This metaphor has guided their efforts to help Taipei define and develop its own distinctive

identity in a global landscape. Grounded on examples of cities such as Kyoto, Barcelona, and Rome, fermentation refers to the mechanisms by which residents help to shape the city as a coherent unity made up of diverse neighborhoods in a composed and harmonious way. As the fermentation process clarifies and composes the diverse flavors of a wine, City Yeast seeks to clarify and compose the placemaking qualities of a city, neighborhood by neighborhood. For City Yeast, fermentation involves the following elements.

Starting with a single street or neighborhood. City Yeast has the aspiration to revitalize the city of Taipei. Yet it never treats the city as a monolithic whole. It acknowledges Taipei's heterogeneity and its many unique places – developing Taipei's distinctive identity is to make sense of each place and then unite them as a coherent composition. It thus combines the contemporary theoretical construct of the "assemblage" [37] with its heterogeneous and ever-dynamic logics, with the metaphor of winemaking, with its chemical transformations and cultivated integration of complexity. This task requires interventions street-by-street and neighborhood-by-neighborhood, especially the historic ones (e.g., Dadaocheng, Dihua Street, and Shilin district). Their history, quaint buildings, and traditions partially remain and thus serve as a basis for revitalization. In this sense, implementing smart city technologies and applications can take a bottom-up approach – starting with a single street or neighborhood and "blended" with this neighborhood's specific streetscape and color theme (e.g., where and how the traffic sensors should be placed).

Directly involving people of the streets via co-design and participatory events. Street and well-defined neighborhoods are regarded as places – their order is civil, their structure is centered, and their identities are being made and remade [19]. These qualities are not outcomes of design; they are the results of the daily activities of those who live in them. City Yeast's fermentation approach pursues action by directly involving the residents and local businesses in those streets or neighborhoods in placemaking. By living there, their collective memory restores the past of a place, their familiarity and lived experience preserves its present, and their expectations inspire its future. Through various co-design practices and participatory events, these local individuals become "yeasts," who contribute to designing the city's future in a collective and gradual manner by sharing inter-connected perceptions, experiences, and understandings of places. For these yeasts to work, technologists will need to develop participatory infrastructures to inform design and implementation.

Identifying the unique qualities of life and pull them forward. By involving residents as "yeasts," City Yeast collaborate with the people of street and neighborhood places to rediscover the uniqueness of their everyday life experience, return to the tradition, and leverage their visibility. This is regarded as the legitimate way to reclaim a city's identity. In particular, City Yeast and residents focus on the visibility of Taipei in the following aspects: 1) its history, which can feature multiple significant moments in the past (e.g., Shilin's fame of cultivating scholars in the Qing dynasty), making the past episodic rather than monolithic; 2) its geography – Taipei as the capital of Taiwan as a node in a complex Asian network: multiple waves of Chinese culture, the Taiwanese aborigines, the international atmosphere from Taiwan's Japanese and American influences, and the spirit of striving from Southeast Asia are all packed in Taipei; 3) its best products, including rare Chinese herbal medicine, bakeries, Formosan oolong tea, local dry food, agriculture produces, and handcrafting. These products provide a holistic sensual experience of Taipei through taste, smell, visual, sound, and touch. For many residents, it is this sensuality that makes Taipei familiar, recognizable, and memorable; 4) its cherished traditions, which distinguish Taipei from other generic Westernized cities. Older neighborhoods in Taipei, though being seedy, represent a traditional life style that is valued by many residents – the feeling of warmth, neighbors who know and take care of one another, and traditional markets where goods, greetings, stories, and experiences are exchanged. Revitalizing Taipei, therefore, does not mean replacing the older neighborhoods with newer global buildings but to raise the visibility of these cherished traditions to its (younger) residents. In this sense, smart city technologies should also incorporate everyday life quality and valued traditions (e.g., a "neighborhood carpool" feature in car sharing apps).

As all the "yeasts" (residents) interact and collaborate with one another, their collective memories, perceptions, and experiences gradually contribute to a consensus about what people value most about a neighborhood place. This eventually leads to a "fermentation" where the rich and brewed character of that neighborhood place becomes legible, defined, and cherished.

Placemaking for Smart/Connected Cities

This far we have shown how City Yeast and Taipei residents proposed a fermentation approach as placemaking for solving the dilemma of urban decay and urban renewal in Taipei. However, it should be noted that City Yeast's collective design efforts tend to focus on older neighborhoods and streets in Taipei, considering them the core of urban life and the root of Taipei, rather than modern global-generic shopping and business districts. We find that these insights raise important challenges to the current research agenda of urban informatics and smart cities in HCI. As urban spaces are becoming increasingly connected and networked, much attention has been paid to how mobile and ubiquitous computing can be

deployed and unfolded in these environments; but less is known about how residents perceive these changes to their city and lived experience, and how they react to the destruction of their familiar places. In other words, we focus on the technical construct of a city but often neglect the cultural and social aspects of city life [4, 10, 13]; we value the practical organization of space but usually ignore the cultural organization of space [11]; we turn particular cities into generic world cities but somehow sacrifice their specific economic, technological, spatial, and social production [10, 13, 28, 49].

One question that all of these raises for HCI is whether urban streets and neighborhoods face a whole new wave of deadening generification. The technologies that make cities smart and connected – IoT, sensors, mobile networks – are not developed in and for the likes of Dadaocheng. The experiences that they seek to intensify do not clearly map onto traditional fruit markets; they do not rise out of the hopes of an older generation raising a younger generation in the neighborhood they once played in. Will these technologies help make such neighborhoods vibrant again – or will they further distinguish the newer neighborhoods from them? Will they signify through their absence that a neighborhood has gone to seed, that it is ready to be torn down and replaced with modern, smart, and connected buildings? The alternative might be to try out an approach like that of City Yeast, that is, to situate urban informatics inquiry on a particular street, to involve its residents, and to notice, to clarify, and to build on the traces of the past, the whiffs of meaning, that persist beneath the dusty red lanterns, next to the mango cart, gleaming in the fluorescent light of the signs above the camera shop.

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