Pins and Posters:
Paradigms for Content Publication on Situated Displays

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The metaphors of pins and posters have inspired two publication paradigms for public displays. Researchers implemented these paradigms in the Instant Places system, which they deployed on 10 displays in diverse urban locations. The findings help improve the understanding of what might drive user-generated content in networks of urban displays.

Digital public displays of various sizes and form factors are an increasingly important element of our technological landscape and could radically change communication in public and semipublic spaces. Eventually, this trend could enable us to move from a world of closed display networks that function as isolated islands to scenarios in which large-scale networks of pervasive public displays and associated sensors are open to applications and content from many sources.[1] In these scenarios, displays would become a medium that users could exploit for whatever communication goals they find valuable. User-generated content would become a commodity that could drive entirely new services and business models related to public displays.

However, studies suggest a large gap between public displays' potential as a communication medium and people's necessary grasp of the related communication process (see the sidebar, "How People Perceive Large Public Displays"). Although eliminating this gap will require people to master interaction techniques, this problem clearly goes beyond the mere issue of how to interact.

Consider the simple example of sending an SMS (short message service) message. When one person sends the message to another, the context is well defined by the service itself and by the shared context between those people. When sending the message to a public display, even though the interaction remains the same, the sender loses any reference on which to base his or her expectations of how that content will be seen, interpreted, or repurposed.

A similar reasoning applies to using social networks, such as Facebook or Twitter, as publication tools. It might be simple to enable content to flow to public displays. However, it's still unclear how to extend the publication paradigms from those systems to the specificities of content sharing on public displays.

We thus envision that overcoming the challenges of meaningful communication using public displays will require specific paradigms that enable people to control and reason about how content is published. Toward that end, we explored two paradigms inspired by existing forms of personal self-expression: pins (badges) and posters. We employed these paradigms on Instant Places, a system with which registered users publish content on public displays.

Instant Places

As part of our ongoing research on situated displays, we developed Instant Places as a Web-centric platform for place-based screen media.

System Components

Instant Places' main components are *places, personal identities*, and *display applications*.

How People Perceive Large Public Displays

Display systems are still far from reaching their potential as an open communication medium. People tend to perceive these systems' content as irrelevant and learn to ignore the displays.[1] Enticing people to participate in and contribute regularly to public displays is itself a problem. Elaine Huang and Elizabeth Mynatt observed that individuals tend not to be motivated to supply content or have difficulty identifying appropriate content.[2] Jörg Müller and his colleagues described how people might perceive public displays as a stage on which they'll act only if they feel confident about their actions and in full control over the presentation of self.[3] Nemanja Memarovic and his colleagues showed how public displays are part of a communicative ecology in which they're associated mainly with content that addresses a community and its interests.[4]

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Places. A place might have one or more displays. They represent a symbolic environment that provides a meaningful context for situated social interaction—for example, a restaurant, a shopping center, an office, or a city park. The place owner decides which content to accept on that place's displays. We assume that place owners integrate user-generated content into their displays as a way to engage with visitors to their place.

Personal identities. Identities let people explicitly and systematically manage publication and self-exposure in public displays. Through the Instant Places website (www.instantplaces.org), people can create identities and use them to publish content either by attaching pins to them or creating posters for distribution across the display network. An identity's presence in a place is signaled through a check-in procedure in the Instant Places mobile client, which is currently an Android application. One or more personas enable people to control how the identity profile is exposed in different settings.

Display applications. Place owners can select multiple display applications for use on the displays. The applications should be able to adapt their behavior according to the place's available resources and current circumstances. The system handles sensing and interaction information associated with places—for example, current check-ins and user data. In addition, it provides an integrated API from which applications can obtain this information. Applications can also access data shared in that place by users—for example, pins and posters—so that they can create visualizations of that data.

Pins and Posters

A publication paradigm frames, under a single, well-understood concept, a particular way to establish the relationship between content, identities, places, and applications. Existing paradigms offer known metaphors for a range of publication scenarios. The communication practices they enable already incorporate multiple forms of locality and social rules that might be leveraged for public displays.

In the nondigital world, people use pins and posters extensively to express identity, announce events, support causes, advertise products, and identify people with social groupings or organizations. In the digital world, the pin and poster paradigms complement each other in that they provide different models for thinking about publication in public displays.

Pins. A pin refers to an institution, cause, campaign, sports team, artist, or brand that people might identify with. On the Instant Places website, people can associate pins with their identities by going to their account and selecting from a list of predefined pins. A pin comprises a visual icon, a name, a set of tags, and a set of sources from which people should be able to generate screen content—for example, a YouTube channel, Flickr photo collection, or blog.

Pins aren't exactly a mechanism for user-generated content, in that the pin user and content author normally aren't the same. Instead, pins work more on a crowdsourcing model in which users express support for or interest in particular content sources. As people check in to places, this information might be exposed as part of their identity and used to increase the popularity of the content associated with those pins.
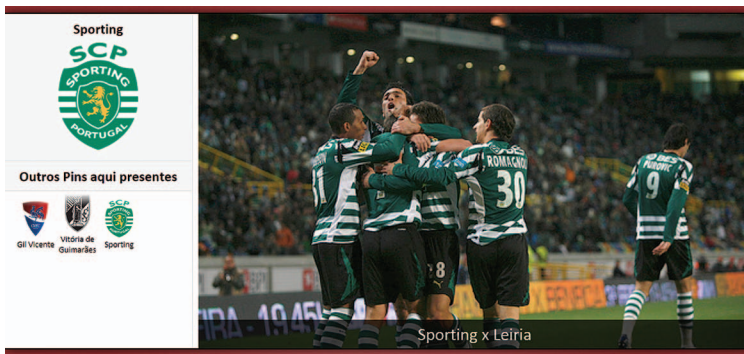
Figure 1. A soccer application driven by visitors' pins (badges). The public display shows the pins (in this case, team logos) and content associated with them.

Figure 2. The poster application exhibiting artwork. The application rotates the set of posters accepted at a place, showing the poster content along with its title and the author's identity.

For this study, we created an application that displays content associated with the soccer teams supported by place visitors (see Figure 1). We created a pin for each soccer team in the Portuguese Premier League. When a user checks in at a place, if he or she has selected a pin, the display shows content associated with that pin's team. The application also shows the pins of other users at that place, thus providing a global view of the place visitors' preferences. When no selected pins currently exist for that place, the application iterates over the most popular pins.

We also created pins representing the top 20 artists from *Rolling Stone* magazine. Users could select the pins, but because there was no application to exhibit them, they were never displayed.

The sources associated with pins are assumed to be trusted publishers. So, moderation of the content isn't so much about preventing offensive content. It's about aligning the content that people might display with what's considered appropriate for a particular place.

Posters. A poster is basically just a picture for display. The authoring occurs at the Instant Places website. Users simply upload a poster picture, give it a short title and description, and schedule its availability for display (the current maximum is one month from the creation date).

Place owners approve which posters to display by going to their place webpage on the Instant Places website and selecting from a list of available posters. Users can recommend posters for a particular place through the Instant Places mobile app; recommended posters appear at the top of the list. When a place owner approves a poster, it becomes immediately available for presentation at that place. The poster application (see Figure 2) rotates the set of accepted posters, showing each poster along with its title and the author's identity. The author can remove a published poster, but it can't be changed. This aims to facilitate moderation by providing a permanent reference to the content that's shared across the system.

The Living Lab on Situated Displays

The Living Lab on Situated Displays is a set of urban displays in the Minho region of Portugal. The lab started in 2008 with the exploration of Bluetooth-based interaction with public displays.[2] (For more on this and other related research, see the sidebar "Related Work in Situated Engagement with Public Displays".) Since then, we've made multiple deployments of public displays at various types of locations, with diverse research goals.

The study we report here involved 10 displays at seven locations over six months during 2012. Over the first four months, we deployed Instant Places across these sites; it was fully deployed at all locations during the last two months. Four displays were at our university (one in a bar, one in a library, and two in our department), three were at cafés in the city center of Guimarães, two were in schools, and another one was in a public library. Figure 3 shows two installations. These locations provided very different publics for the system, not only because of their different characteristics but also because some of them served different crowds at different times. They're also associated with diverse organizational characteristics—size, procedures, and so on.

We invited people to use the system through instructions that appeared occasionally on the displays and through postcards distributed at the locations.

Data Collection

At month 4, we invited the 59 registered users to answer an online survey. The survey asked them about their motivation for registration, their first impressions of Instant Places, and the main ob-

stacles they found when using it. Seven males and two females, from 23 to 37 years old, responded.

At month 6, we conducted semistructured interviews with five place owners, six system users, and six regular viewers of the system who hadn't become users. The interview scripts for each group differed slightly. However, the scripts all dealt with the practices related to each paradigm and the perceptions about authorship, moderation, and appropriateness. All participants received an informed-consent form explaining the study's purpose. To help contextualize the interviews, we conducted them where the participants had interacted with the system. We recorded and transcribed the interviews.

We also gathered quantitative data from usage logs that had been collected automatically since the study started. The logs included information about all the main interaction events (for example, poster publication, check-ins, and pin selection). We obtained information about mobile-app installations from Google Play.

The Results

During the study, users (both place owners and individual system users) created 106 accounts, all based on either Facebook or Google profiles. Our Android app registered 63 installations, 20 of which were still active at the study's end. Twenty-one unique users generated 193 check-ins. Twenty-seven unique users added 63 pins to their profile (2.33 pins per user). Fifty-five unique users created 176 posters; four of the creators were place owners. (Our research team created another 127 posters to stimulate engagement and create a content baseline.)

Publication Practices

A key goal was to uncover practices related to the effective use of the publication paradigms, to inform the system's evolution and the design of additional paradigms and tools. All the usage occurred spontaneously as the result of the system's availability across the 10 displays. We didn't engage in any active form of recruitment, and we gave no prescriptive instructions for specific usages of the system. The 63 pin selections and 176 posters can thus be seen as genuine attempts to exploit the possibilities that Instant Places offered.

Pins. Most pins (39) were from the soccer collection, which isn't surprising because those were the only ones displayed. The two local clubs (Guimarães and Braga) had 14 pins; the three major national teams had 23 pins. This reflected the general preferences of the region's soccer fans. Almost

(a)   **(b)**

Figure 3. Installations of the Instant Places system at a (a) university bar and (b) café. We invited people to use the system through instructions that appeared occasionally on the displays and through postcards distributed at the deployment spots.

all the 24 music pins were picked at least once, but there was no clear preference.

Most users seem to understand the pins' role as an expression of personal preferences:

> When we saw the pins, we knew it was about soccer and that we should select the team of our preference. (user 1)

However, pins didn't capture the user engagement we had hoped. Two main reasons for this emerged in the interviews. First, the pin collection was small and soccer centric. Although soccer is clearly a hot topic in this cultural setting, many people still felt they didn't identify with the available pins:

> I have only used one once because there were only pins I do not identify with very much. (user 2)

Other users expressed the desire for more personal pins. For example, one user wanted a pin for his band; another wanted a pin of his neighborhood.

Second, many users failed to clearly associate their pin choices with the displayed content:

> I thought the pins would have some impact on the system; perhaps the most popular ones would be shown on the display. At the time, I chose one, but I could not really understand its purpose beyond the characterization of the user profile. (user 4)

The lack of engagement was exacerbated by design decisions that made it difficult for pins to influence the display's behavior. To share a pin, users had to select it, check in through the Android app, and indicate the place they were in as a favorite.

Related Work in Situated Engagement with Public Displays

Ronald Schroeter and his colleagues showed how finding the right combination of people, content, and location is crucial to achieving the right type of situated engagement with public displays.[1] This view is in line with our own motivation. We aim to explore publication paradigms that constitute particular ways to frame valuable connections between people, content, and location.

Publication practices related to nondigital displays have served as a design inspiration for new practices related to digital displays. Florian Alt and his colleagues explored traditional public-notice areas to uncover practices behind their operation.[2] They discussed these practices' role in the design of future globally networked public displays.

Adrian Friday and his colleagues studied publication practices related to large-scale networks of public displays in a long-term analysis of Lancaster University's e-Campus deployment.[3] Focusing on the display managers' perspective, they highlighted the diverse requirements that different stakeholders, even in a single organization, might have regarding display control and how to publish content.

Researchers have studied a range of techniques that enable people to submit content for public displays. One early example, the Plasma Poster, let people submit photos, text, and webpages using email or a Web form.[4] SMS (short message service) and MMS (Multimedia Messaging Service) have also served as interaction techniques to spontaneously generate content. For example, the Joe Blogg project included a display in the form of an interactive artwork through which people could send pictures and text messages, using MMS or SMS.[5] The Hermes Photo Display employed Bluetooth to let users send pictures and other media to a display.[6] Rui José and his colleagues described using Bluetooth names to provide interactivity.[7] A user entered predefined commands in his or her mobile phone's Bluetooth name. When that person approached a display, it obtained and interpreted those commands as part of the user's preferences. José and his colleagues viewed this technique as an opportunistic approach that was easily deployed on a range of mobile devices.

These and many other studies[8] have addressed the challenge of enabling people to approach a public display and spontaneously generate and submit content to show on it. We aim to move beyond the interaction itself and focus on shared publication paradigms that enable people to understand and control what happens after content reaches the display system.

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This created an excessive distance between selecting and displaying a pin.

Posters. Posters generated considerably more user engagement. The 176 posters' content fell into 13 categories (see Table 1).

The most popular category involved support for soccer teams and, occasionally, other sports (32 posters). The European soccer championship that took place during the study might have strongly influenced these numbers. However, this category didn't involve any immediate, obvious reward for the person publishing the poster, other than some sense of identification with a community.

For the more niche hobbies—for example, cars and games (six posters) or music bands and actors (14 posters)—the main motivations were probably self-expression and the desire to make a personal statement:

> I have made a poster about a concert that I have really enjoyed and that I wanted to share with other people. (user 4)

> It is great to announce certain things with which I am associated. With Facebook, only my friends get to see it; with Instant Places multiple people can see it. (user 2)

Similarly, the cooking category (15 posters), which

was popular at one of the schools, was mainly a form of personal expression about favorite foods rather than useful instructions.

Advertising events (31 posters) included mainly parties, school events, sports events, and concerts. Some of these posters were created by place owners who saw the system as a tool for communicating with their community:

> I announce live music events and also other types of events such as the launch of a book we had the other day or the availability of a new product on our menu. (place owner 2)

Institutions also used posters to advertise courses and create awareness about local activities (26 posters):

> It is interesting for us to advertise our courses, but also to advertise the many great things happening in our school, such as the world championship in robotics and other prizes that we won. (place owner 5)

Similarly, individuals used the displays for personal advertising (17 posters). Two photographers created posters based on their portfolio, an author advertised his recently published book, and some students announced their project exhibitions. One poster advertised a commercial brand.

The last main category involved the display of nonprofessionals' art (14 posters). In most cases, the publisher wasn't the artist but someone showing something he or she appreciated—for example, by a daughter or friend. At one of the schools, students employed posters to show their schoolwork:

> It is an extra motivation when someone has made a nice work to have it shown to the community. The colleagues will see it, they know the person, and this will normally result in conversations and comments about the work. (place owner 1)

We also asked the users about their content creation practices. The poster format (an image and a text title) was clearly limiting. We didn't expect this to be a problem because most users were creating content for public displays for the first time. However, at one of the schools, a community of students got involved in publishing posters. They found themselves trying to make their posters more attractive to differentiate them. This led to a series of evolving practices and increasingly sophisticated designs. At first, this meant realizing the importance of large fonts for visibility, but it quickly progressed:

Table 1. Posters published.

Category	No. of posters	%
Fan—soccer or other sports	32	18.2
Advertising—events	31	17.6
Advertising—institutional	26	14.8
Advertising—personal	17	9.6
Cooking suggestions	15	8.5
Fan—music or actors	14	8.0
Personal artistic expressions	14	8.0
Other (errors and tests)	8	4.5
Fan—cars, games, and other	6	3.4
Humor	6	3.4
Personal photos	3	1.7
Causes	3	1.7
Advertising—brands	1	0.6
Total	176	100.0

> To make the poster more attractive, we add image effects, we add a contour, or we change the color of the photo. It grabs peoples' attention. (user 1)

In another case, a photographer wanted to present images from his portfolio. To deal with our limit of one image per poster, he created interesting photo collages, each a themed composition that fully exploited the horizontal display.

The use of a widely known format, such as images, revealed two additional insights regarding content creation. The first was the importance of letting users leverage their favorite tools. Users reported using PowerPoint, Paint, Word, and even combinations of these. This flexibility in tool selection might have been crucial in enabling many of them to become publishers.

The other insight was about the importance of repurposing content. Many poster images were downloaded from online sources and published as is. This was often the case with events, many of which already had some form of online poster. For example, a worldwide campaign against soldier children occurred during the study. The fact that the campaign already provided poster images in various sizes and languages might have been fundamental in leading one user to repurpose that content to create a poster. Such repurposing is a trend that might considerably help increase media sharing on public displays.

Despite being convenient, repurposing had limitations. In some cases, the information on the repurposed content was too small to be legible at the display's normal viewing distance. Also, most pictures had a vertical orientation, thus failing to fully exploit the displays' horizontal orientation.

The main problem users identified regarding the poster paradigm was the lack of feedback on publication:

> We do not perceive the advantage of creating these posters. [On Facebook] we have likes, we have some feedback. (user 3)

Not having a sense of when or even if their content had been presented was clearly frustrating.

Some users also expressed the desire to display their content in specific situations. For example, students at one of the schools cared only about having their poster shown during the breaks when all their colleagues would be there to see it. In such situations, any other content would just be perceived as taking time away from what really mattered.

Situatedness

A key element of situated publication is how to enable the association between user-generated content and particular situations—how to define the spatial, temporal, or circumstantial scope of publication. Digital content can potentially be published anywhere and as many times as wanted. So, we want to understand how to incorporate situatedness into publication in a way that more effectively helps correlate that content's relevance with particular situations.

Posters. Regarding the spatial scope, a clear tension existed between content that authors perceived as strongly locative and content that they wanted to disseminate to as many locations as possible:

> The important [thing] is to spread the message to multiple locations because if only presented here it is very limiting. (place owner 5)

This tension became particularly evident regarding our poster distribution process. At first, users created posters on the Instant Places website but had to check in at the places where the posters should be distributed. This approach was a direct metaphor for what happens with physical posters and matched nicely the type of locativeness we desired. However, we quickly realized that this process was too restrictive and cumbersome. In early interviews, some users reported engaging in successive check-ins at multiple places, even if they weren't physically there, just to be able to quickly disseminate posters to all those locations.

So, we changed the process. After month 4, posters immediately became available anywhere as soon as they were created. Users could still check in at a place and recommend a poster for that place.

When we made this change, it became clear that many users had never even considered the existence of similar displays at other locations. Some of the participants weren't happy about the new process. This was particularly evident at one of the schools, where teachers were encouraging students to post content but then became worried that such content might appear elsewhere:

> We should be able to control that what is published here stays here. We have posters with student photos in school activities, and having that shown in places we do not even imagine raises many questions in terms of usage and security. (place owner 1)

Some individual users also weren't comfortable with the idea that the posters they had created for a specific location could now appear anywhere.

However, views on this issue seemed to depend strongly on the nature of the content. The place owner at the school we just mentioned also considered that dissemination outside the school would sometimes be the right approach:

> It would be great if you could set that posters were only for the school because then we could control what was public or not, although in some cases it would be interesting to have some content disseminated to other schools or even to the local community, as when we want to announce open events. (place owner 1)

Time was another key dimension for situatedness. Although users could specify how long to display their posters, most of them simply used the maximum allowed time (one month), apparently without giving much thought to the issue. Concerns about a poster's validity over time were strong only for posters announcing scheduled events:

> If it was an event, I would try to set validity to the day of the event; otherwise I always used the maximum time. It gives us a month, [doesn't] it? (user 2)

More sophisticated management of situatedness occurred with a poster supporting the national soccer team in the European championship. Although the championship's end date was known, the date when the team would be eliminated wasn't. To avoid the potential embarrassment of placing a support message after the team had been eliminated, the poster's creator set it to display

until the next game. If the team won, the creator resubmitted the poster.

Pins. Here, situatedness essentially reflected the users checked-in at any moment and the pins they exhibited. Users could choose whether to show their pins at a particular place by selecting different personas. However, we observed no cases in which users seemed to be trying to control their self-exposure on the basis of their interpretation of the situation related to a particular display.

Social Negotiation
The various forms of social negotiation involved in the shared use of public displays should also be a key element in shaping publication paradigms.

Moderation. Most place owners expressed that moderation would be important for their use of the system, but effective moderation practices differed substantially between the place types. For example, at the schools, both the teachers and students perceived moderation as fundamental. Other places, such as bars, had a more relaxed attitude. Some place owners were even comfortable with no moderation, as long as they could remove posters they felt were inappropriate. We asked the place owners how best to deal with situations in which published content had to be removed. They all felt the removal of content shouldn't generate any explicit rejection message to the author:

> I do not think that people should be notified. It could generate a sense of unease, and if the person sees that her poster is not being shown and really wants to know why, she can ask the person in charge. (place owner 3)

The existence of moderation seems to have been enough to formulate a shared sense of what was acceptable. Only one poster was rejected; a bar's customers wanted to publish a poster poking fun at other customers, and the place owner told them it wouldn't be appropriate.

Still, tension often existed between what the display users valued and what the place owner perceived as valuable for the place. The interviews at one of the schools (place owner 1) were particularly instructive. Students seemed to appreciate the more informal nature of the display and that it gave them a way to express their tastes in sports, music, or motorcycles. The teacher acting as the display owner did see such freedom as an asset to engage students with the system. However, that owner also expressed the desire for higher-quality posters that addressed less mundane topics and were more relevant to the entire school community.

Regarding pins, although moderation was less of an issue, we still observed concerns with the set of pins that could be displayed. This was the case with pins for rival soccer teams from nearby cities. Although those pins weren't offensive per se, displaying them in particular places was clearly considered provocative. This suggests that even when a place owner selects an application that displays trusted content, he or she might still need the ability to filter content that might not be appropriate for that place.

Identity. Identity also was an important part of social negotiation. When designing the poster application, we considered using the personas to indicate a poster's author. Instead, we used the normal identity name, partly because we assumed that

- publishing a poster should be seen as a public act and
- displaying the identity name would be a form of accountability that could prevent many sorts of inappropriate behavior.

The study's results suggest that our choice was correct. In the interviews, place owners often mentioned that when they selected posters, the author's name and their familiarity with the author were key selection criteria:

> Recognizing the person as one of our students was very important. Even if the poster was not directly linked with the school, it was still content from someone from our community, and the students would be very satisfied to see their poster presented to others. (place owner 1)

Also, some users perceived the public display of their name as adding credibility to the poster and being rewarding:

> I liked seeing my name when I made my first poster. (user 4)

Others could see advantages in anonymity, at least regarding what appeared on the display:

> I like to have my posters associated with my name when I want to show that I am the author. However, there should be an option to not show the name, as the poster needs to be approved anyway. (user 2)

However, we don't know whether the lack of anonymity prevented anyone from creating a poster.

Social connections. The relatively low number of displays wasn't sufficient to create a strong sense of network. Nevertheless, some place owners became mutually aware and exchanged content to increase the posters' reach:

> I received a phone call from [place owner 2] asking if I could show their posters on my display and they would do the same with mine. (place owner 4)

Such back-channel interactions hint at the type of social connections that new publication paradigms might incorporate.

Overall, the participants appreciated both publication paradigms, but, as we mentioned before, posters clearly generated much more use. The abilities to receive feedback and remove content in specific situations were the features users missed most. So, future research will concentrate on providing these features. Also, several regular system viewers mentioned that the requirement of running an Android client prevented them from using the system.

Clearly, publication paradigms for public displays must be flexible enough to accommodate diverse social contexts and reflect the sophisticated nature of how humans connect with places. These two publication paradigms can serve as starting points for the evolution toward more, and more sophisticated, paradigms. The practices we identified might constitute initial hints for that evolution. For example, the especially complex role of time in event-related posters suggests a type of poster tailored to such use. The different views on the posters' locativeness suggests a type of poster that's inherently locative and can't be shown at other locations.

These findings' generalization to large-scale display networks is also challenging. This is mainly because many behaviors might emerge only after a certain critical mass of users, displays, or applications is reached or after practices evolve. Our two paradigms' scalability to very large display networks could also be questioned.

The explicit representation of social connections between places and between people and places might provide an interesting path for dealing with those challenges. Users' references to "people from our community" or "places with which we could share content" suggest that a formal representation of these connections in publication paradigms could strongly affect publication practices. This would enable new forms of situatedness and provide the basis for crowdsourcing models that might improve these publication processes' scalability.

Acknowledgments

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