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Identity, Safety, and Information Management within Communities of Practice in Location-based Augmented Reality Games: A Case Study of Ingress

Completed Research

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Abstract

This research examines play communities of the location-based AR game *Ingress* to identify and describe community practices specific to these kinds of games. The unique features of location-based AR gameplay result in several novel community standards, behaviors, and practices that impact player safety, privacy, and information security in the *Ingress* community. We discuss practices related to preserving physical safety and privacy, addressing bullying and harassment, information and operational security, and player apprenticeship. In addition, we identify critical ways that individuals' real-world identity impacts their play behavior in public spaces, resulting in self-imposed play limitations.

Keywords

Augmented reality, safety, privacy, information behavior, communities of practice, location-based games, Ingress.

Introduction

Recently there has been growing interest in location-based augmented reality (AR) games (ARGs), which provide novel gameplay experiences by blending aspects of real and virtual worlds. Since 2018, we have witnessed the launch of several new AR games based in major entertainment intellectual properties (IPs), pointing toward further growth of the genre. The unprecedented popularity of *Pokémon GO* highlighted many issues such as gameplay can cause. Popular media sources have reported accidents and injuries, luring attempts, and disputes between players and non-players (M2 Advisory Group 2018), revealing issues with information behavior, safety, privacy, and ownership of real and virtual space that are unique to ARGs. While some behaviors, such as bullying and other crimes, are not unique to ARGs, AR features add to these challenges. Communities of practice (CoPs) have emerged around these games, allowing players to establish mechanisms and standards for recruitment, training, coaching, information behavior, privacy, safety, and in-game behavior.

CoPs were described by Lave and Wenger (1991) in their situated learning theory: “groups of people who share a concern or a passion for something they do and learn how to do it better as they interact regularly” (Wenger-Trayner 2018, p.1). Knowledge generation and transfer occur within communities. Newcomers to a community begin at the “edges” with legitimate peripheral participation and move toward the center by learning about the community, building self-identification with it, and adopting more of its practices.

Wenger, McDermott, and Snyder (2002) have refined and described three essential characteristics of a community of practice: domain, community, and practice. The *domain* creates a sense of common ground,

shared identity, and accountability to a body of knowledge and development of practice. *Community* is the “social fabric of learning,” fostering “interactions and relationships based on mutual respect and trust” (p. 28). The *practice* of a CoP is “a set of frameworks, ideas, tools, information, styles, language, stories, and documents that community members share” (p. 29).

Many scholars have examined CoPs surrounding games (see Bogost, 2008; Delwiche 2006; Steinkuehler 2004). However, we currently lack an understanding of how the attributes of AR games—played in the real world, in real communities, by individuals with mobile devices—might generate CoPs geared toward these unique affordances and constraints. Additionally, we lack an understanding of how real-life characteristics of players or situations in the real world can impact individual involvement. Currently, there is little empirical data on how or why communities of players develop standards and practices for AR games regarding their use, limitations, and positive and negative impacts on their lives.

This paper presents a case study of the game *Ingress* (Niantic 2013) to investigate how CoPs form around ARGs, and the role they play in managing safety and privacy concerns, and information. Though *Pokémon GO* is more widely known than *Ingress*, *Ingress* has a longer history of development and play than *Pokémon GO*. *Ingress* also requires stronger cooperation among players for in-game success, whereas the benefit of cooperation in *Pokémon GO* is comparatively limited, making *Ingress* a better candidate for examining social behaviors of game players. In addition, a re-launch of the game, *Ingress Prime* (Niantic 2018) bolstered by the new network Niantic established through *Pokémon GO*, took place in October 2018, leading to an influx of new players.

In this work, we aim to answer the following research questions:

1. What *unique issues* regarding safety and information must the *Ingress* COP address due to the novel, real-world aspects of AR gameplay?
2. What *practices* has the *Ingress* COP developed to address the novel, real-world impacts to safety, privacy, and information of AR gameplay?
3. In what manner does *individual identity* affect participation in the *Ingress* CoP and gameplay?

Relevant Work

ARGs and Ingress

While AR is a strictly defined term from the computer science domain for systems that enhance real-world views with supplemental information (Azuma 1997), the definition has recently been stretched to include games and applications that use GPS data and maps. ARGs are sometimes called *mixed reality games* (or *hybrid reality games*: having both digital and real-world components) or *location-based mobile game* (LBMG: available on mobile platforms with mechanics dependent on player location) (de Souza e Silva 2008). Some scholars use the term *pervasive games*, taken from the field of pervasive (or ubiquitous) computing, to describe “digital games that move [...] into the physical world to occupy time and place on a human scale” (Falk and Davenport 2004, p. 127).

In the case of *Ingress*, players join one of two factions to vie for virtual control of real-world locations and territory by gaining control of *portals* that are mapped to real world locations. Teams control portals and deploy *fields* by connecting controlled portals into a triangle. These *field ops* (i.e., field operations) often involve multiple *agents* (players) and can include hundreds of agents if the objective is to *throw megafields* (create fields that cover multiple states or countries). *Ingress* is also a massively multiplayer online (MMO) game, as all players are simultaneously participating in one global game environment, and network access is required for play (Yahyavi and Kemme 2013).

CoPs in Games

CoP research on collective gameplay, community standards, and apprenticeship is well established. Bogost (2008) concludes that video game play can be understood as a CoP, and “the people who play video games develop values, strategies, and approaches to the practice of play itself” (p. 119). Using *Animal Crossing* (Nintendo 2001) as an example, Bogost delineates practices of the *Animal Crossing Community* (Bogost 2008), an Internet community where players develop tools for sharing information about the game, curate

training documents, “apprentice” new players, answer questions, and give welcome gifts. Bogost concludes, “video game play is a cultural activity where values develop over time.” (p. 119).

Oblinger (2006) notes, “the description of a game community mirrors closely the definition of an educational community of practice” (p. 5). Galarneau (2005) notes that CoP for teaching and learning in online games spontaneously emerge from mutual goals. In game-based learning environments, collective action by CoPs is leveraged to solve problems. Moseley (2008) studied *Perplex City* (Mind Candy 2005) and its CoP, describing communication, information, and puzzle-solving collaboration practices that emerged there.

Safety, Privacy, and Identity

According to structural symbolic interactionist identity theories, one’s sense of self is comprised of many identities, each with the personal internalization of meaning one finds in society. The set of meanings attached to an identity is its standard. While an identity may be shared among many (e.g. woman, gamer, or researcher), each individual’s standard for an identity is unique. These identities are the source of our behavior. As social situations arise, some of one’s identities become more salient, and one acts in accordance with the standards of those identities, confirming them as part of one’s self (Burke & Stets, 2009).

Social interaction and cooperation are required for many types of location-based play, and the networked, social nature of *Ingress* means that even those attempting to play solo may find themselves interacting with others. Both official game software and third-party play aids can reveal player locations to others. Some *Ingress* players appreciate encounters with other players, whether app-mediated or real-world (Licoppe and Inada 2006). Others attempt to minimize the personal information available to others—including real names, home locations, and workplaces—even while participating in coordinated activities. When deciding to meet others in person, each player makes situational safety behavior choices based on personal history, location of meetings, and knowledge of others involved. New *Ingress* players are often contacted by advanced players within their faction through in-game communication channels soon after starting.

Ingress play can lead players to unfamiliar, possibly dangerous locations. In addition to taking measures to ensure their bodily safety, players often take precautions because play requires expensive mobile devices, raising concerns about theft. There have been at least two deaths tied to *Ingress* gameplay (Olivetti 2016; Larkin 2016), and news sources have reported other ARG safety incidents, including a woman becoming lost in the wilderness while playing *Ingress* (NBC 2016).

Publicly available gameplay information seems limited when compared to the information collected by Niantic. All aspects of gameplay are subject to data collection, including location and navigation records while the game client is active. Hulseley and Reeves (2014) even warn that “*Ingress* encourages players to actively participate in a surveillance community while also normalizing data mining and surveillance as a valid exchange for the privilege of play” (p. 390).

Cyberbullying, Online Harassment, and Cyberstalking

Patchin and Hinduja (2006) distinguish between bullying and harassment by noting that harassment has specific legal connotations while bullying often implies cruel but legal behavior of one towards another. Incidents of such possibly illegal behavior often go unreported by victims who believe they have no legal recourse or that the authorities will choose not to take complaints seriously (Alexy et al. 2005). While some research exists regarding negative online interactions, little has been applied to virtual and real-world interactions through ARGs. An exception is Paavilainen et al. (2017) who noted respondents in their study on *Pokémon GO* play experiences reported threats of physical violence against and condescending attitudes towards *Pokémon GO* players.

Study Design and Methods

We conducted semi-structured interviews with 30 *Ingress* players from the same CoP to investigate players’ thoughts, opinions, and behaviors within the community, until data saturation was reached. The interview contained 39 questions on different aspects of *Ingress* gameplay. Of the 30 interviews, 26 were conducted in person and recorded, ranging from 22 to 98 minutes, and averaging approximately 55 minutes. We also conducted four interviews via email to respect the participants’ preference. With assistance from the local

community leaders, we recruited players from both factions, with play styles from casual to very active. We sought diverse ethnographic characteristics to include the breadth of players actively engaged in the game. This community of players is located in the Pacific Northwest area, particularly Western Washington.

All interview data was organized and analyzed using NVIVO. Interviews were openly coded, following an inductive approach. We then grouped codes to represent common themes and refined them through an iterative process. We followed a consensus coding process (Hill et al. 1997) where two independent coders aim to reach an agreement in code application with the third person acting as a tie-breaker for cases of disagreement. The final codebook comprised 31 codes.

Overview of Study Participants

The team interviewed 17 players from the “Enlightened” faction and 13 from the “Resistance.” Sixteen of the interviewees were female and 14 male. The average age was 32.5, while ages ranged from 23 to 75. The participants’ income levels spanned from \$0 (unemployed) to over \$150,000 per year, and players reported a wide variety of occupations, including stay-at-home parents; formerly homeless people in transitional housing; and employees of for-profit companies across a range of industries (software, healthcare, education, retail, food service), academia, and non-profit organizations. The median interviewee had been playing the game for 20 months, and almost all played daily. Five identified as LGBTQIA+ and four disclosed disabilities that affect gameplay.

Findings and Discussion

Our findings address our research questions, focusing on the *unique issues* of Ingress play, *practices* of its players, and the impact of their *identities* on play behavior.

Explanatory Framework

Our results provided rich detail on the role of CoP and identity in mediating player information practices, privacy, and safety behaviors, which we illustrate in a new explanatory framework (Figure 1). The “possibility space” of play is defined by the affordances of the software, the designed mapping of real-world spaces to the virtual play space, and the real physical environment. Within these constraints, players exhibit behaviors related to personal safety and privacy, and security of team game information (operational security). Our work found that these behaviors are mediated by two additional factors: 1) *player* and their characteristics including identity and ability, and 2) *others* including other game players and non-players in the world. We found that players self-limit behaviors due to their identities—specifically as women, persons of color, and members of the LGBT community—due to concerns of safety and privacy, ultimately affecting gameplay. We also found evidence that player behaviors are mediated by their abilities, such as socioeconomic status (financial ability) and physical, mental, and psychological ability.

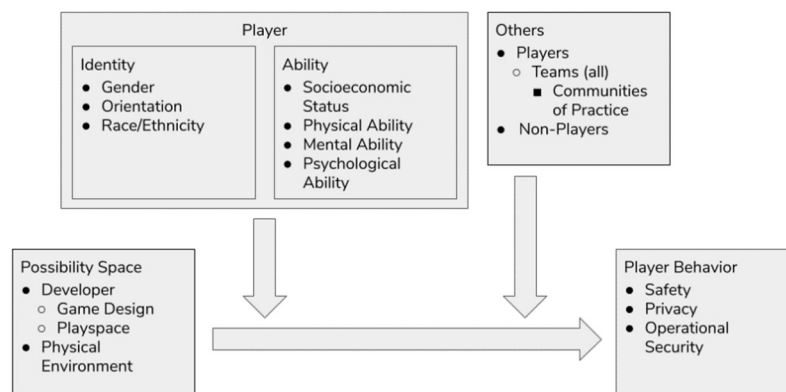


Figure 1. Explanatory Framework

Information Practices

A key set of CoP practices involve “operational security.” Because *Ingress* is played in the real world and requires information sharing to execute team goals, there are strategic advantages to observing, seeking leaks in, or even infiltrating the opposing team’s information systems and activities (spying). Elaborate security practices have been developed and were among the most important practices for players to learn and uphold if they wanted to participate in significant play events. Four specific practices were observed: 1) player vetting, 2) securing communications, 3) event security, and 4) operations security.

A player’s first encounter with community practices typically begins with being “vetted.” New agents must meet a specific number of previously vetted team members in person and attend an in-person event to make sure they are a legitimate asset (P6). New players also need to agree to abide by community standards and practices. This process, exercised by both teams, ensures that players are “real,” have been exposed to the community, and can follow rules (P15). One player stated, “I am the point of contact for my area so new players, I usually meet up with them before bringing them into the chats, answer questions about the game, that kind of thing” (P12). Another player said, “Most of the time, we require a face-to-face, which the new people always had a problem with. When I was new, I had a problem; people just don’t get it. But once you are actually kind of into it for a while you understand” (P13).

When players have been successfully vetted, they are allowed in “secure” chat channels, where most team communication occurs. Because of spies and unvetted players, teams do not use the application’s native team channels (P27), and communicate via third party apps (e.g. GroupMe, Slack) (P15). Secrecy is stressed and operational information sharing outside of secure channels was forbidden, even for non-*Ingress* friends and family members (P6). There are information systems with even higher levels of security where only highly engaged, highly trusted team leadership are allowed in (P5) and where even leaders only gain access when necessary (P15). This results in a military-like organization structure with levels of leadership and access. In the Pacific Northwest, the factions have different approaches to leadership and hierarchy, but both invoke basic aspects of operational secrecy and military intelligence.

According to interviewees, espionage is an effective tactic to derail the opposing faction (P12). Members of both factions review the “intel map” constantly to find clues to opposition plans, create fake accounts to monitor in-game opposite chat, and even surveil real-world locations.

Event and activity planning constitutes the third key area in which the CoP practiced operational security. The most frequent activity requiring team members to plan and co-locate is known as “farming,” a means of quickly acquiring game resources, requiring eight *Ingress* players to produce the best resources (P9, P18, P22). At these events, people socialized and farmed game resources. Gatherings observed by the authors ranged from eight to over 30 people. A key practice among the community is to avoid attacking enemy portals on the way to a farm (P9) since opponents could track these activities, locate a farm, and disrupt it. Some players called such indiscretions on the intel map “thunderfeet” (P24).

Other activities and events that were securely shared with vetted players include planning meetings and operations (“ops”) (P8, P15). An op is a plan requiring careful planning, good communication, and coordinated execution from many team members. They can be relatively small—few players in one neighborhood—or very large—hundreds of international participants (P14). “Smashing” ops occur when players come together to attack opposing neighborhoods. This is often done in a “car smashing” convoy to cover more territory (P30). “Field ops” are attempts to create huge fields over enough area to win a cycle of the game (P22). P16 made it very clear that even one player from the opposing team can cause an entire operation to fail. Frequently, fielding operations include an after party where dozens of players celebrate and socialize which is often secret as well (P30).

Controlling access to operation plans is critically important. Both teams actively seek opposition plans, creating a strong need to protect them (P24). Some players will watch the intel map for signs that opponents are “out of place” or that a portal may soon be used in an op (P4, P24). Because *Ingress* is an ARG, operational security extends into the real world, as teams monitor physical locations for evidence of activity. Being part of the core regional team and CoP is critical to opportunities for play, and therefore the majority of players moderate their behavior within the play possibility space to account for these practices.

Privacy and Safety Issues

Ingress moves gameplay into public spaces and provides unfiltered information about player actions. As a result, a host of issues have emerged that had not previously existed with video games. The *Ingress* CoP has developed practices and standards to address privacy, safety, and harassment. A major theme among participants is the belief that the real-world gameplay in *Ingress* raises the stakes for upholding community standards in these areas, and access to community events is predicated on maintaining good standing in the community, resulting in CoP-mediated behaviors around safety and privacy.

Critical incidents in the community prompted the development privacy practices which most members of both teams continue to follow and promote. All the interviewees were aware that their location in the real world and many of their actions can be tracked while playing. The *Ingress* application includes a scrolling activity log that reports many common game actions, such as attacking or capturing portals, which reveal real-time locations of the players. Third-party developers have used *Ingress* data to allow real-time mapping of agent play and long-term monitoring of agent play activity over a wide geographic area. P16 added, “I think one of the things that make this game special is that not only do we have the power to track each other but that we can also use that knowledge about how we are tracked to our advantage whether that's to ensure our personal safety or to ensure some other in-game advantage.”

While astute players can figure out where players live and work, a lot more information is available by watching the intel map (P4, P7, P13, P16). “This game, if you pay attention, you know exactly where people are, their schedule, you know where they go, and you know when they go there. Creepy. I have met a lot of people who are creeped out by that. I just am not. But I am also very, very aware of that. I am silent on purpose a lot” (P13). P16 explained that some players create a fake “couch portal” (a portal accessible from home) by putting specific items on a portal. This practice gives a false impression that they are actively gathering resources from it in an attempt to confuse the opposing team and conceal their real home.

P4 used the term “intel show” when talking about monitoring *Ingress* intelligence tools, stating:

“The ‘intel show’ as it's called, by a lot of people, is definitely a thing. Where people spend their days watching the intel, seeing where agents are, seeing what their patterns are. And it's a strategy because then if you know an agent's normal hood, when they are out of their neighborhood it's like ... hey [agent P4] is over in this area. Something may be up. Which is why I try to be pretty random.”

Other players noted that frequent player routes (such as commutes) and even home areas and workplaces can be identified. P12 noted, “The times I am online, the routes I take to go places. I am sure all of that is being collected. Or even sold, I wouldn't be surprised.”

To address privacy concerns, the local *Ingress* CoP upholds a practice described by P8 as “play the portals, not the agent”: Players are expected to focus on specific portals and not players. P14 added “We'll often talk about where somebody's desk or couch portal is, but we never talk about the specific residence they live in. And we don't ever share publicly where our couch portals are. [...] You don't bring up people's kids.”

Despite accepting the risk, a number of interviewees reported incidents where they felt threatened by actions of other players, or where players utilized personal information to locate and even intimidate another player. For instance, P29 told a story about a local player, known to harass others, who let her know that he was aware of her couch portal by dropping certain in-game items on it in a provocative manner. In another instance that P21 shared, a particular male player began stalking a female member of his own team, eventually learning where she lived and leaving a note on her front porch. Ultimately the stalker was issued a court order to cease playing *Ingress* in what appears to be the first court-ordered desist action pertaining to an AR game. Additionally, P9 reported an instance of being followed, noting she was unaware of it until the other player revealed himself. P22 reported that she was attacked by a wandering person with a disposable shaving razor while on a remote trail near a park.

Another complex example targeting specific players in the game grew from the idea of attacking a player's *guardian portals* and the practice *guardian hunting*, with the goal of linking specific players to specific portals at specific times. The “onyx guardian badge” has been retired by Niantic, but at one time was awarded to players who held the same portal for 150 consecutive days. Players would seek information to

target specific players. Partly due to this sort of behavior, the Guardian badge was retired; however, such targeted portal destruction remains a strategy for some game special events.

Safety (Player Versus Environment)

Safety was a major theme that emerged during interviews, and involved many different behaviors and beliefs related to player well-being, such as situational awareness, risk-taking, self-policing, defensive strategies, and even addiction. Broadly, two safety issues emerged: 1) users putting themselves at risk due to the design of the game and the way they play it, and 2) users encountering risks presented to them by other players.

Interviewees commented on the need to be aware of surroundings while playing *Ingress*, and aspects of gameplay that make that difficult. AR games put individuals in the real world while also taking attention away from it. P6 stated, “I’m conflicted. Sometimes I’ll stay focused, and be in the real world, instead of like, looking at something else.” P8 said,

“I’m buried in the scanner and I look up, and I’m like wait, where did I just walk into? [...] I’ve lost my situational awareness. Ok, I need to come back into being situationally aware of the real world that’s going on around me while I am doing this thing.”

Some players intentionally participated in risky behaviors. The fact that key geolocated points must be accessed in person creates circumstances where advantageous gameplay carries risk, like traversing dangerous terrain, overcoming fences, or approaching cliffs. For example, P7, who is scared of heights, relayed an anecdote of hiking above a waterfall and losing the trail on the way to a remote portal. There, they became stuck on a ledge and dealt with rocks being kicked down on them by other hikers until other hikers threw them a rope.

Bullying/Harassment (Player Versus Player)

Sometimes players also felt unsafe due to other players’ behavior towards them. For instance, participants reported player actions where the goal is to “make a statement” or “send a message” to other players (*statement making*) rather than accomplishing strategic objectives.

A relatively benign form of statement making is the act of leaving a symbolic portal key as a calling card after completing an attack. For instance, players from a specific neighborhood shared that they often collect keys from a portal called “Welcome to [neighborhood]” and drop them in an area they have attacked. A more concerning example of statement making involves destroying *couch portals* or *desk portals* (a portal accessible from home or work). Having such access offers one the opportunity to extract resources from it regularly. Opponent play near such locations can seem personal, and even threatening. P3 felt unsafe and nervous after she found an item left on her couch portal by an opponent with an aggressive reputation. She interpreted this as a threatening message—“I know where you live”—and temporarily quit the game.

Self-policing within CoP emerged as a reaction to some gameplay risks. Many interviewees said teams eject members that become unsavory (P4, P6, P8, P13, P17).

“I’ve seen people not being accepted by the community for being terrible people, for being mean to others, for sexual harassment” (P6).

Some female participants also described practices developed to keep one another safe.

“A lot of women were like ‘yeah he was totally creepy’ so now we are like okay, if anybody seems creepy, come out and say it so that it doesn’t take six women feeling creeped out by this one guy before he gets kicked out” (P1).

Community policing across faction lines is also a practice that emerged.

“People from one faction will send a direct message to another player of the opposite faction, generally one they have some sort of prior working relationship with, and

some kind of trust established. Like, I don't think you're an asshole because you're on the other team, let's talk about this" (P15).

A private conversation could occur to discuss the dispute or conflict, establish what occurred, and decide how to work with the players involved to solve the issue, typically with intermediaries.

"If players are not meeting community norms to such a point that nobody wants to play with them, then they are ejected from the community" (P15).

P17 summarized common sentiments among interviewees about self-policing in an ARG:

"The communities tend to be sort of self-policing ... from what I have seen, if people do things that are problematic it gets dealt with. [...] It gets addressed in a way that I have not seen in any gaming communities that I am part of. And I think the fact that Ingress has both a real-life face to face component, and an online component, makes it unique. Not just from a gaming standpoint, but from a community standpoint. Because everyone does have to interact with each other in a face to face setting, there seems to be this added impetus to keep things policed in a way that makes the community cohesive in those face to face settings" (P17).

Similarly, P8 explained:

"This is our tribe, these are our friends and you don't get to act this way. So, it's a self-policing society. You don't want to lose your players; you want to be able to make eight easily[...] I think we're really good about seeing people's toxic behavior and going, yeah, we're not going to welcome that."

As such, the incentive for following CoP standards is heightened, resulting in play mediation by CoP norms.

Other concerns emerged from people in traditionally marginalized groups, who were more cognizant of potential safety issues. Three black players (P2, P3, P31) reported being careful about when and where they play due to racism and being "watched with suspicion" (P3). Female players reported incidents of stalking and inappropriate behavior from men. And several LGBTQ players reported feeling especially vulnerable while playing alone in some areas.

Implications for ARGs

Implications of this work suggest game designers should aim to address the following three questions pertaining to information, privacy, and safety when designing AR games in the future:

1. How do we capitalize on the tendency of AR players to self-organize and self-police, and empower these emergent communities of practice within AR games to communicate and cooperate within and across teams to promote safety and prosocial behavior?
2. How do we design a game with a winning condition that engages real-world play, that simultaneously avoids rewarding behaviors that may lead players to endanger themselves or others?
3. How do we design a mixed reality game that facilitates social play and CoP in the real world while also protecting player identity?

Conclusion and Future Work

The unique issues the *Ingress* CoP faces due to the real-world nature of gameplay includes risks to physical safety to achieve game goals, "spying" and attempts to gather information from in-game and out-of-game systems, which include monitoring real-world locations and behaviors, risk of exposure of real-world identity, and a spectrum of harassment that included stalking, bullying, and intimidation that crosses the digital-physical divide.

The *Ingress* CoP has created unique practices to address issues that cross the divide between digital and real-world gameplay, and lead players to self-police and modify behaviors to conform to community norms.

For information and operational security, practices include a sophisticated method of recruitment and verification, standards for communication tool use, levels of information classification and security, and practices for obscuring physical whereabouts in the real world. The CoP has also developed practices for communicating behavioral expectations, respecting privacy, and reporting and managing allegations of harassment and rule breaking. The study revealed an understood path within the CoP of how *Ingress* players move from the periphery of the community as new recruits, receiving training, apprenticeship, and security clearances as they move toward the center of the CoP as increasingly trusted members.

We conclude that real-world identity mediates real-world play behaviors for many AR game players. Many women report curtailed activities and self-imposed limitations compared to men, and individuals, including the majority of people of color in the sample and two members of the LGBTQIA+ community say they sometimes feel less secure and report limiting some activities based on risks in they see tied with their identities.

The primary limitation of this study is that it does not collect the perspectives of players that quit playing or refuse to play due to the unique concerns of real-world play. Additionally, future work could use survey techniques to verify and generalize findings. Additional interviews could also add depth regarding the concerns and behavior of players with specific identities—particularly women, people of color, and the LGBTQIA+ community—with an eye toward design recommendations.

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